

Findings on Duke Energy's Power Plant Cost Recovery Terms and Implications for South Carolina Ratepayers

April 2018

Executive Summary

In the aftermath of the VC Summer abandonment, South Carolina's electric utilities have a unique opportunity to correct course and take advantage of more affordable energy resources for the benefit of ratepayers. Purchasing clean, low-cost energy from privately-funded, lower-risk independent power producers is a better choice for South Carolina's future than more ratepayer-funded, monopoly-owned power plants.

However, financing any large capital investment requires long-term contracted cash flows. The investor-owned utilities (IOUs) understand this better than most businesses, because their business model depends on their ability to recover the cost of their invested capital over an extended period of time (their "cost recovery term"), without which they could not build a single power plant.

To demonstrate this point, this document summarizes two key findings:

- Duke Energy recovers the capital cost of its power plants over multiple decades from ratepayers. The cost recovery term for power plants owned by Duke Energy Carolinas and Duke Energy Progress (Duke's regulated utilities with SC service territory) ranges from 25 years for its own solar plants, 40 to 53 years for its natural gas plants, and 60 years for its nuclear plants.
- Duke's non-regulated solar projects have an average contract length of nearly 20 years. The average PPA term for all solar power plants owned by Duke Renewables (a separate Duke business unit) is 18.5 years – with a minimum length of 15 years and ranging as high as 30 years.

These findings demonstrate that power plants of any type and scale require predictable long-term contracts to be financed by private investors, whether by IOUs or by private investors in independent power plants. However, in contrast to IOU's multi-decade cost recovery terms, South Carolina's independent power producers are requesting PPA terms of only fifteen years¹ – the widely recognized market standard.²

¹ SC's Energy Freedom Act (S.890/H.4796) would establish a 15-year fixed price PPAs for independent qualifying facilities.

² S&P Global's database of more than 900 power plants (built under PURPA or negotiations with utilities and other buyers) finds that only 2% were built with contract terms of 10 years or less – fewer than 20 projects from 2007 to mid-2017.

Summary of Duke Energy's Cost Recovery Terms for NC/SC Generation Units

As part of Duke Energy's recent testimony to support its active North Carolina rate cases, the company specifies "Depreciable Life Spans" for generation units. According to Dr. Ben Johnson, a consulting economist and utility regulation expert, "The depreciation life essentially determines over how many years the cost of the plant is recovered from customers (how long it remains in the rate base)."³ In other words, unless otherwise explicitly stated, it can be reasonably assumed that cost recovery terms for Duke Energy's generation units are approximately equivalent to their depreciation life spans.

In summary:⁴

Table 1: Depreciable Life Span of Generation Units Owned by DEC/DEP		
	Duke Energy Carolinas (DEC)	Duke Energy Progress (DEP)
Gas combined cycle units	40 years	40 years
Gas combustion turbines	40 to 41 years	40 to 53 years
Steam base-load units	36 to 69 years	52 to 63 years
Nuclear units	60 years	60 years
Solar units	25 years	25 years

Summary of Duke Renewables' Solar Project PPA Terms

According to Duke Renewables, as of late 2017 it owned and operated 600 MW of utility-scale solar projects across the United States.⁵

The PPA terms for these projects are summarized as follows:⁶

Table 2: PPA Terms for Solar Projects Owned by Duke Renewables	
Number of Projects	PPA Term
18 projects	15 years
15 projects	20 years
6 projects	25 years
1 project	30 years
3 projects	Unconfirmed
Summary:	
Average PPA Term:	18.75 years
Minimum PPA Term:	15 years

³ Total Revenue Requirement = (Rate of Return * (Rate Base = Original Cost - Accumulated Depreciation)) + Op. Ex + annual depreciation + taxes. See EEI 2012 ([link](#)) and NARUC training materials ([link](#)).

⁴ Note: the depreciable life spans indicated here (and their relationship to cost recovery terms) are applicable to Duke's regulated businesses, DEC and DEP – not to its non-regulated business, Duke Renewables. The depreciable life spans indicated here for solar are for DEC and DEP's solar projects, which are separate from Duke Renewables.

⁵ Duke Renewables Solar Projects Factsheet. 2017. https://www.duke-energy.com//_media/pdfs/our-company/solar-power-projects-fact-sheet.pdf

⁶ Note: the projects summarized here are owned by Duke Renewables, a non-regulated business unit of Duke that is separate from DEC and DEP. Duke's regulated businesses, including DEP, also own solar projects.

APPENDIX: DETAILS AND CITATIONS

Cost Recovery Terms for DEC/DEP Generation Units

Gannet Flemming conducted Depreciation Studies dated 12/31/2016 that were included in the testimony of Witness Doss in both the DEC and DEP rate cases. The links below take you to the depreciation studies as filed in their respective dockets.

DEC: <http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=3600b0cb-3234-4a99-8897-0081610a9cf1>

- Chart can be found on PP. III-6 through III-7 (PP 39-40 of 286 in the PDF)

DEP: <http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=2dd3d981-5509-42b4-80d1-c7cdd4dc68f4>

- Chart can be found on PP. III-6 through III-7 (PP. 76-77 of 627 in the PDF)

From Pages III-5 through III-6 of the DEC study: “The depreciable life span estimate for most steam, base-load units is 36 to 69 years, which is within the typical range of life spans for such units. The life span for nuclear units is approximately 60 years, and is consistent with the license dates for each unit. The depreciable life span for hydraulic units is 67 to 148 years which corresponds to the license or relicense dates. A life span of 40-41 years was estimated for the combustion turbines. These life span estimates are typical for combustion turbines which are used primarily as peaking units. The combined cycle units are relatively new units with a commonly used 40-year life span estimate. The large solar facilities have recently been constructed and will have a 25-year life span.”

From Pages III-5 through III-6 of the DEP study: “The depreciable life span estimate for most steam, base-load units is 52 to 63 years, which is within the typical range of life spans for such units. With the exception of the Asheville units, these life spans represent the expected depreciable life of each facility under their current configuration. The Company plans to retire the Asheville steam units in 2019. The Company's proposal is to recover the costs of this facility over a 10-year period. For the other facilities, future capital expenditures can extend a facility's depreciable life, however, such changes to depreciable life would not be prudent until the capital expenditures are actually put into plant in service. The life span for nuclear units is approximately 60 years, and is consistent with the license dates for each unit. The depreciable life span for hydraulic units is 104 to 143 years which corresponds to the license or relicense dates. A life span of 40-53 years was estimated for the combustion turbines. These life span estimates are typical for combustion turbines which are used primarily as peaking units. The combined cycle units are relatively new units with a commonly used 40-year life span estimate. All solar facilities have recently been constructed and will have a 25-year life span.”

Duke's most recent rate case in South Carolina was Docket 2016-227-E. A depreciation study was also attached to Witness Doss' testimony. This study is dated 12/31/2010. Alliance Consulting Group conducted the study. Appendix D-2 begins on Pg. 141 of 194 in the PDF and contains a table with column titled “Retirement date used in latest approved study”. The lowest estimated service life is 40 years.

Link: <https://dms.psc.sc.gov/Attachments/Matter/dc49f517-5ed9-4364-88ab-53d6013aeba8>

PPA Terms for Solar Projects Owned by Duke Renewables⁷

Solar Project	State	MW ac	PPA Yrs	In-Service Date	Offtake
Blue Wing	TX	14	30	2010	CPS Energy
Sunset Reservoir	CA	4.5	25	2010	San Francisco Public Utilities Commission
Ajo	AZ	5	25	2011	Arizona Public Service Company
Bagdad	AZ	15	25	2011	Arizona Public Service Company
Seville II	CA	30	25	2015	Imperial Irrigation District
Victory	CO	13	25	2016	Intermountain Rural Electric Association
Caprock	NM	25	25	2016	Western Farmers Electric Cooperative
Stanton	FL	6	20	2011	Orlando Utilities Commission
Murfreesboro	NC	5	20	2011	NCEMC
Black Mountain	AZ	10	20	2012	Unisource Energy Services
Gato Montes	AZ	6	20	2012	Tucson Electric Power Company
Highlander I & II	CA	21	20	2013	Southern California Edison
Pumpjack	CA	20	20	2014	Southern California Edison
Wildwood	CA	20	20	2014	Southern California Edison
Capital Partners, Phase I	NC	20	20	2014	American University, GWU
Capital Partners, Phase II	NC	33.5	20	2014	American University, GWU
Conetoe	NC	80	20	2015	Corning, Inc.; Lockheed Martin
Seville I	CA	20	20	2015	San Diego Gas & Electric
Longboat	CA	20	20	2016	Southern California Edison
Rio Bravo I	CA	20	20	2016	Southern California Edison
Rio Bravo II	CA	20	20	2016	Southern California Edison
Wildwood II	CA	15	20	2016	Southern California Edison
Washington Whitepost	NC	12.5	15	2012	NC Eastern Municipal Power Agency
Millfield	NC	5	15	2013	NC Eastern Municipal Power Agency
Washington Airport	NC	5	15	2013	NC Eastern Municipal Power Agency
Dogwood	NC	20	15	2013	Dominion NC Power
Windsor Cooper Hill	NC	5	15	2013	Dominion NC Power
Bethel Price	NC	5	15	2013	Dominion NC Power
Halifax	NC	20	15	2014	Dominion NC Power

⁷ All information collected from publicly available sources, including CPCNs and media publications.

Battleboro	NC	5	15	2015	Dominion NC Power
Sunbury	NC	5	15	2015	Dominion NC Power
Tarboro	NC	5	15	2015	Dominion NC Power
Hertford	NC	5	15	2016	Dominion NC Power
Long Farm	NC	5	15	2016	Dominion NC Power
Winton	NC	5	15	2016	Dominion NC Power
Garysburg	NC	5	15	2016	Dominion NC Power
Gaston	NC	5	15	2016	Dominion NC Power
Woodland	NC	5	15	2016	Dominion NC Power
Seaboard	NC	5	15	2016	Dominion NC Power
River Road	NC	5	15	2016	Dominion NC Power
Everetts Wildcat	NC	5	?	2014	Dominion NC Power
Creswell	NC	14	?	2015	Dominion NC Power
Shawboro	NC	20	?	2015	Dominion NC Power

DIRECT TESTIMONY AND EXHIBIT OF
WILLIE J. MORGAN, P.E.
ON BEHALF OF
THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF
DOCKET NO. 2018-319-E
IN RE: APPLICATION OF DUKE ENERGY CAROLINAS, LLC
FOR ADJUSTMENTS IN ELECTRIC RATE SCHEDULES AND TARIFFS AND
REQUEST FOR AN ACCOUNTING ORDER

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Willie J. Morgan and my business address is 1401 Main Street, Suite 900, Columbia, South Carolina 29201. I am employed by the South Carolina Office of Regulatory Staff (“ORS”) as the Deputy Director of the Utility Rates Department.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received a Bachelor of Science Degree in Electrical Engineering from the University of South Carolina in 1985 and a Master of Arts Degree in Management from Webster University in 2000. I am a licensed Professional Engineer registered in the State of South Carolina. I was employed by the South Carolina Department of Health and Environmental Control (“DHEC”) as an Environmental Engineer Associate. Later, I was promoted to the position of Permitting Liaison where I assisted industries and the public with environmental permitting requirements in the State of South Carolina. This assistance included providing information about air quality, solid and hazardous waste management, and water and wastewater management requirements. I was employed by DHEC for

nineteen (19) years. In October 2004, I joined ORS as the Program Manager for the Water and Wastewater Department and was promoted to Deputy Director in 2015. Collectively, I have over thirty-three (33) years of regulatory compliance experience providing assistance and oversight for various types of regulated utilities.

Q. HAVE YOU TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA (“COMMISSION”)?

A. Yes. I have testified on numerous occasions before the Commission regarding hearings concerning general rate cases and other proceedings.

Q. WHAT IS THE MISSION OF THE OFFICE OF REGULATORY STAFF?

A. ORS represents the public interest as defined by the South Carolina General Assembly as follows:

The concerns of the using and consuming public with respect to public utility services, regardless of the class of customer, and preservation of continued investment in and maintenance of utility facilities so as to provide reliable and high-quality utility services.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to address certain areas of the ORS’s examination of Duke Energy Carolinas, LLC’s (“Company” or “DEC”) application for adjustments in its electric rate schedules and tariffs and request for an accounting order under Docket No. 2018-319-E (“Application”). My testimony will specifically address the following adjustments to:

- 1) Amortize deferred cost balance related to the Carolinas West Control Center;
- 2) Amortize deferred cost balance related to the W.S. Lee Combined Cycle Plant;
- 3) Adjust reserve for end of life nuclear costs;
- 4) Adjust for Lee Nuclear amortization;

5) Amortize deferred cost balance related to SC Advanced Metering Infrastructure technology (“AMI”); and

6) Normalize for storm costs.

These adjustments, more fully discussed below, were provided to the ORS Audit Department and are shown in Audit Exhibit GS-2 of ORS witness Smith.

Q. PLEASE EXPLAIN THE ADJUSTMENT TO AMORTIZE THE DEFERRED COST BALANCE RELATED TO THE CAROLINAS WEST CONTROL CENTER.

A. Commission Order No. 2018-552 granted the Company’s petition for an accounting order to defer certain capital and operating costs incurred since January 1, 2018 associated with the Company’s Carolinas West Control Center. The Company deferred approximately \$5 million for certain capital costs incurred by the addition of the Carolinas West Control Center. Among other things, DEC requests to amortize the deferral balance over three (3) years.

ORS recommends an amortization period of thirty (30) years, which is the service life of the Carolinas West Control Center. This recommendation is reflected in ORS witness Smith’s Exhibit GS-2, Adjustment #7.

Q. PLEASE EXPLAIN THE ADJUSTMENT TO AMORTIZE THE DEFERRED COST BALANCE RELATED TO THE W.S. LEE COMBINED CYCLE PLANT.

A. Commission Order No. 2018-552 approved an accounting order which permitted DEC to defer certain capital and operating costs incurred for the construction of its W.S. Lee combined cycle plant in Anderson County. Company Adjustment #13 amortizes these

1 deferred amounts over three (3) years and includes a return on the unamortized deferral
2 balances.

3 ORS recommends the amortization of these costs over the remaining service life of
4 the W.S. Lee combined cycle plant, which is thirty-nine (39) years. This recommendation
5 is reflected in ORS witness Smith's Exhibit GS-2, Adjustment #13.

6 **Q. PLEASE EXPLAIN THE COMPANY'S PROPOSAL TO ESTABLISH A**
7 **RESERVE FOR END OF LIFE NUCLEAR COSTS.**

8 **A.** The Company proposes to adjust depreciation and amortization expenses to
9 establish a reserve for end of life nuclear costs not captured in its decommissioning studies.
10 These costs include, but are not limited to, estimates for end of life nuclear fuel and parts
11 inventory that are not currently known and measurable. The Company proposes to
12 annually accrue approximately \$6.975 million from South Carolina ratepayers to be placed
13 in this reserve fund until its nuclear plants are decommissioned. The current operating
14 licenses for the Company's nuclear units, issued by the Nuclear Regulatory Commission
15 ("NRC"), will expire between 2033 and 2043. Additionally, the Company can file for an
16 additional license extension for its nuclear plants. Information provided by DEC for this
17 rate case shows that the company [REDACTED]

18 [REDACTED]. See Confidential Exhibit WJM-1.

19 ORS recommends the Commission deny the Company's request of approximately
20 \$6.975 million for a reserve fund for its end of life nuclear costs. The reserve fund includes
21 estimates for end of life nuclear fuel and parts inventory that are not currently known and
22 measurable. The date of retirement of the nuclear units is uncertain. It is not equitable for
23 today's customers of DEC to pay for costs related to nuclear plant retirements that may or

may not occur in the next fourteen years. The ORS adjustment to remove the requested reserve fund is reflected in ORS witness Smith's Exhibit GS-2 as Adjustment #15.

Q. HAS ORS REVIEWED THE PRE-CONSTRUCTION COSTS ASSOCIATED WITH THE LEE NUCLEAR PROJECT?

A. Yes. ORS reviewed DEC's testimony requesting recovery of the pre-construction costs associated with the cancelled Lee Nuclear Project. ORS also reviewed the previous orders issued by the Commission and correspondence submitted to the Commission by DEC, including quarterly reports. Additionally, ORS reviewed the documents considered by the North Carolina Utilities Commission ("NCUC") regarding DEC's request to recover its North Carolina allocable share of costs associated with the Lee Nuclear Project.

ORS finds that DEC's decision to incur costs to obtain the Combined Operating License and support preconstruction activities were reasonable – based upon the information available to DEC at that time the costs were incurred. However, ORS does offer a recommendation which adjusts DEC's request.

Q. WHAT IS ORS'S RECOMMENDATION REGARDING PRE-CONSTRUCTION COSTS ASSOCIATED WITH THE LEE NUCLEAR PROJECT?

A. DEC is seeking Commission approval to recover approximately \$125 million (South Carolina retail) over twelve years. The associated annual revenue requirement requested in this proceeding is \$20 million. The total (system) estimated balance for the Lee Nuclear Project is approximately \$559 million forecasted to May 31, 2019. This total estimated balance includes Allowance for Funds Used During Construction through December 31, 2017.

1 ORS recommends the Commission disallow DEC's recovery of \$129,443 (South
2 Carolina retail) related to pre-construction costs for the Visitors Center associated with the
3 Lee Nuclear Project. The Visitors Center is not constructed. The expenditures related to
4 the Visitors Center were not necessary to support DEC's process to obtain of a Combined
5 Operating License from the Nuclear Regulatory Commission for the Lee Nuclear Project.
6 Except for the costs related to the Visitors Center, ORS recommends the Commission
7 approve the pre-construction cost of the Lee Nuclear Project which total \$124,601,000
8 (South Carolina retail) without a return on the investment.

9 **Q. WHY DOES ORS RECOMMEND THE COMMISSION NOT ALLOW A RETURN**
10 **ON THESE PRE-CONSTRUCTION COSTS?**

11 **A.** Due to its cancellation, the Lee Nuclear Project will neither be used and useful nor
12 provide electricity to DEC's customers; therefore, the Company's investment does not
13 meet the criteria to be placed in "plant in service." Likewise, the investment is not properly
14 categorized as "property held for future use" or "construction work in progress." Thus, the
15 investment does not belong in rate base and is not entitled to a return. It is not fair or
16 reasonable for shareholders to earn a return on a cancelled nuclear project when the
17 customers receive no benefit yet are required to pay for this cancelled project. ORS
18 recommends the risks of the Lee Nuclear Project be equitably shared between the DEC
19 shareholders and its customers through the disallowance of a return on debt and equity.

20 **Q. DOES ORS'S RECOMMENDATION TO DISALLOW A RETURN ON THE LEE**
21 **NUCLEAR PROJECT REFLECT PREVIOUS COMMISSION DECISIONS?**

22 **A.** Yes. The Commission has a practice of balancing the interest of the customers and
23 DEC by approving cost recovery yet disallowing a return on debt and equity. Specifically,

1 this Commission made a similar decision regarding the cancellation of other nuclear
2 construction projects in Order No. 83-92 in Docket No 1982-50-E. The Commission
3 found,

4 The Commission Staff, as to Perkins and Cherokee Units 2 & 3, and the
5 consumer advocate, proposed a sharing of the costs associated with these
6 units between the company and ratepayers by recommending an
7 amortization without rate base coverage.
8

9 The Perkins Plant nor Cherokee Units 2 and 3 have been or will be used and
10 useful in providing electric service to the Company's customers. The
11 Commission is of the opinion that to require rate payers to pay a return on
12 this investment is not reasonable. The inclusion of the unamortized
13 balances in the rate base would be inconsistent with the ratemaking
14 principle that the Company is entitled to earn a return on the investment
15 used and useful in providing service to the ratepayers. Therefore, the
16 Commission denies the Company's proposal to include the unamortized
17 amounts associated with the Perkins Nuclear Station and the Cherokee
18 Units 2 and 3 in rate base.

19 **Q. ARE THERE OTHER SIMILAR COMMISSION DECISIONS?**

20 **A.** Yes. The Commission has issued similar decisions denying a return on debt and
21 equity related to abandoned utility projects. I have listed two Commission orders to
22 identify examples:

- 23 1) Commission Order No. 82-284, Docket No. 81-163-E
24 2) Commission Order No. 83-583, Docket No. 82-328-E

25 **Q. DID THE NCUC ALLOW RECOVERY OF THE VISITORS CENTER, AS WELL**
26 **AS, A RETURN ON THE CANCELLED LEE NUCLEAR PROJECT?**

27 **A.** No. In its 2018 ruling, the NCUC denied DEC's request for cost recovery of the
28 Visitors Center as well as, a return on the Lee Nuclear Project. NCUC provided the
29 following in its Order under Docket No. E-7, Sub 1146:

19. That DEC's request to recover its project development costs relating to the Lee Nuclear Project is granted, with the exception of costs relating to the Visitors Center...

20. ...and that the Company shall not earn a return on the unamortized balance.¹

Q. PLEASE EXPLAIN THE ADJUSTMENT TO AMORTIZE THE DEFERRED COST BALANCE RELATED TO SC AMI.

A. Commission Order No. 2016-489 granted the Company's petition for an accounting order to defer certain capital and operating costs associated with the Company's roll out of AMI. The Company proposes to adjust depreciation expense and income taxes for the amortization of deferred costs related to SC AMI. The accounting Order issued by the Commission allowed DEC to defer into a regulatory asset until this rate case: 1) the financial effects of the depreciation expense of the AMI meter deployment to include the carrying costs on the investment at its weighted average cost of capital; and 2) to establish a regulatory asset for the book value of non-AMI meters in the amount of \$31 million through which the Company is allowed to continue to depreciate existing meters under current schedules approved by the Commission.

ORS recommends the Company be allowed to amortize these costs over fifteen (15) years, which is the service life of the AMI meters. This recommendation is reflected in ORS witness Smith's Exhibit GS-2, Adjustment #19.

Q. PLEASE EXPLAIN THE ADJUSTMENT TO NORMALIZE STORM COSTS.

A. Company Adjustment #20 normalizes storm restoration expenses in the Test Year to a 10-year average, resulting in an increase in test year expenses of approximately \$7 million for South Carolina retail. Due to fluctuations in annual storm restoration costs,

¹ NCUC, Order, Docket No. E-7, SUB 1146, dated 6/22/2018, page 330

ORS recommends eliminating the expenses in the highest and lowest years and to use an eight-year average expense level. The ORS normalization adjustment is reflected in ORS witness Smith's Exhibit GS-2, Adjustment #20.

Q. WILL YOU UPDATE YOUR TESTIMONY BASED ON INFORMATION THAT BECOMES AVAILABLE?

A. Yes. ORS fully reserves the right to revise its recommendations via supplemental testimony should new information not previously provided by the Company, or other sources, become available.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2018-319-E

In the Matter of:)	
)	DIRECT TESTIMONY OF
Application of Duke Energy Carolinas, LLC)	NILS J. DIAZ, PhD
for Adjustments in Electric Rate Schedules and)	FOR DUKE ENERGY
Tariffs)	CAROLINAS, LLC

I. INTRODUCTION

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Nils J. Diaz and my business address is 3414 West Gables Ct.,
3 Tampa, Florida, 33609.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed by The ND2 Group, LLC (“ND2”), as its Managing Director.
6 ND2 is a policy advising and consulting group with a strong focus on nuclear
7 energy matters. ND2 presently provides expert advice for clients in the areas
8 of nuclear power licensing and deployment, high-level radioactive waste
9 disposal, processing and storage issues, and advanced security systems.

10 **Q. PLEASE SUMMARIZE YOUR EDUCATION, PROFESSIONAL**
11 **QUALIFICATIONS, AND OTHER INDUSTRY EXPERIENCE AND**
12 **AFFILIATIONS.**

13 A. I hold a Bachelor of Science Degree in Mechanical Engineering from the
14 University of Villanova, Havana, and MS and PhD degrees in Nuclear
15 Engineering Sciences from the University of Florida. I presently conduct
16 policy advising and consulting for the U.S. government, foreign governments,
17 and industry. I hold board memberships in private institutions and the position
18 of Professor Emeritus of Nuclear Sciences at the University of Florida. I
19 served as a Commissioner on Florida’s Energy and Climate Commission from
20 2008 to 2010, recently chaired the ASME Presidential Task Force on
21 Response to Japan Nuclear Power Plant Events, and chaired two major
22 reviews of the Safety Culture and Quality Assurance Program for the Hanford

1 Waste Treatment Plant. I previously served as the Chairman of the United
2 States Nuclear Regulatory Commission (“NRC”) from 2003 to 2006 and as
3 Commissioner from 1996 to 2006. Prior to my appointment to the NRC, I was
4 the Director of the Innovative Nuclear Power and Propulsion Institute for the
5 Ballistic Missile Defense Organization of the U.S. Department of Defense
6 from 1985 to 1996. I have testified as an expert witness to the U.S. Senate and
7 House of Representatives on multiple occasions over the last thirty years.
8 Additional details on my background and experience are provided in my
9 summary resume, which is attached as Exhibit NJD-1.

10 **Q. DOES YOUR TESTIMONY INCLUDE ANY EXHIBITS?**

11 A. Yes, I have included three exhibits:

12 Exhibit NJD-1 – Summary Resume of Nils J. Diaz, PhD;

13 Exhibit NJD-2 – Expected New Nuclear Power Plant Applications (2008); and

14 Exhibit NJD-3 – U.S. NRC: COL Applications Received through June 15,
15 2017.

16 **Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION?**

17 A. No.

18 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

19 A. The purpose of my testimony is to review the reasonableness and prudence of
20 the strategy and efforts of Duke Energy Carolinas, LLC (“DE Carolinas” or
21 the “Company”) to obtain a combined license (“COL”) for the William States
22 Lee III Nuclear Station Units 1 and 2 (the “Lee Nuclear Project”).

1 **Q. PLEASE DESCRIBE YOUR PERTINENT EXPERIENCE FOR**
2 **REVIEWING DE CAROLINAS' APPROACH TO THE LICENSING**
3 **OF THE LEE NUCLEAR PROJECT.**

4 A. From my tenure as an NRC Commissioner starting in 1996, I have been
5 evaluating licensing issues and applications submitted to the NRC,
6 specifically issues related to the new licensing process under 10 CFR Part 52
7 whereby utilities are issued a COL before construction on the plant begins. I
8 reviewed Westinghouse's Advanced Passive ("AP") safety designs, beginning
9 with the AP600. The AP600 was the first of its kind, a standardized passive
10 safety reactor. Its final Design Certification was issued in March 2000. I am
11 thoroughly familiar with the Westinghouse AP1000 new nuclear plant design,
12 reviewing Westinghouse's applications and the NRC staff safety reviews for a
13 period of ten years, including the AP600 reviews. I was directly involved in its
14 Design Certification process and signed its first Final Design Approval
15 (Revision 15) in March 2006. The AP1000 Design Certification is referenced
16 by DE Carolinas in its COL Application ("COLA"). Furthermore, I am
17 cognizant of the 10 CFR Part 52 licensing process, as used by DE Carolinas to
18 obtain the COL for the Lee Nuclear Project. In addition to my direct
19 experience with the AP1000 design and NRC processes, I also participated in
20 Florida Power & Light's ("FP&L") applications to the Florida Public Service
21 Commission ("FPSC") to obtain necessary approvals for the development of
22 two AP1000 reactors at FP&L's Turkey Point site ("Turkey Point Units 6 and
23 7"). I began working with FP&L to assemble the need determination in 2007

1 for the FPSC and continued contributing to FP&L's annual nuclear cost
2 recovery proceedings until 2015. During my nine years working with FP&L, I
3 provided expert testimony and testified before the FPSC annually, covering
4 issues related to FP&L's licensing requirements, submittals to the NRC and
5 other agencies, the overall environment for licensing new nuclear power
6 plants and power upgrades, and specific issues impacting the pursuit of the
7 COL for Turkey Point Units 6 & 7. I reviewed the reasonableness and
8 prudence of the management strategy and activities, as well as the associated
9 costs.

10 **Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?**

11 A. The remainder of my testimony is organized as follows:

12 II. THE 1990'S: STEPPING STONES TO NEW REACTOR
13 DEVELOPMENT AND LICENSING

14 III. 2000-2010: CONFLUENCE OF CONTRIBUTING FACTORS TO
15 NEW NUCLEAR POWER DEVELOPMENT

16 IV. ANALYSIS OF DE CAROLINAS' DECISION TO PURSUE A COL
17 FOR LEE NUCLEAR PROJECT

18 V. OBSTACLES TO LICENSING THE LEE NUCLEAR PROJECT ON
19 SCHEDULE

20 VI. REVIEW OF DE CAROLINAS COL AND PROJECT-RELATED
21 DECISIONS AND COSTS

22 VII. CONCLUSIONS

1 **II. THE 1990'S: STEPPING STONES TO NEW REACTOR**
2 **DEVELOPMENT AND LICENSING**

3 **Q. WHAT WERE THE FACTORS THAT CONVERGED TO SLOW**
4 **DOWN THE CONTINUING DEVELOPMENT OF NUCLEAR**
5 **ELECTRICITY GENERATION IN THE UNITED STATES BY THE**
6 **EARLY 1990S?**

7 A. By the early 1990s, the road to new nuclear power development had been
8 hindered by a combination of negative factors, commencing with the financial
9 and market disruptions from the “oil embargos,” the Three Mile Island
10 accident in 1979, and the convergence of high construction costs, double digit
11 inflation and interest rates, decreasing load demand, significant construction
12 delays, regulatory uncertainty, and relatively poor economic performance of
13 the operating nuclear plants.

14 **Q. WHAT FACTORS CHANGED TO IMPROVE THE DEVELOPMENT**
15 **OF NUCLEAR POWER?**

16 A. Several factors were improving by the early 1990s, starting with an effort by
17 the NRC to establish a more predictable and less onerous licensing process for
18 nuclear power plants and followed by improvements in nuclear plant
19 performance and economics, more advanced nuclear technology, and
20 increased financial stability and sustained economic growth for the nation.
21 The NRC produced in 1989 its first major change in new reactor licensing by
22 promulgating the 10 CFR Part 52 Rule (“Part 52”), which was focused on
23 decreasing financial risk and standardizing the design and construction of

1 nuclear power plants. The Part 52 rule was then codified in Section 185(b) of
2 the Atomic Energy Act (AEA) by the Energy Policy Act of 1992 (“EPAC-
3 92”). The EPAC-92 was promulgated by the United States Congress to
4 establish a more effective framework for the development of nuclear power,
5 anchored in standardized, safer, more reliable nuclear reactors, implementing
6 strategies to minimize financial and regulatory risk. The resulting strategies
7 included: 1) licensing decisions are to be finalized before major construction
8 begins; 2) utilities would order their plants after regulatory/financial risks are
9 mitigated by satisfactory completion of the new licensing process; 3)
10 standardized, safer reactor designs are to be encouraged; and 4) limited site
11 work could begin when warranted by effective project management.

12 **Q. WHAT IS PART 52, AND HOW WAS IT SUPPOSED TO**
13 **CONTRIBUTE TO REGULATORY LICENSING EFFECTIVENESS**
14 **AND PREDICTABILITY?**

15 A. Part 52 – LICENSES, CERTIFICATIONS, AND APPROVALS FOR
16 NUCLEAR POWER PLANTS is a newer reactor licensing process that can
17 be substituted for the licensing process specified in Part 50 – DOMESTIC
18 LICENSING OF PRODUCTION AND UTILIZATION FACILITIES. In other
19 words, Part 50 continues to be the main regulation for nuclear reactors, but
20 issues specifically dealing with the licensing of new reactors can be treated
21 under Part 52. Part 52 shifts the burden and uncertainty of NRC licensing to
22 the front end of the development process. Part 52 is a powerful addition to
23 nuclear power plant regulations that authorizes construction and conditional

operation after a comprehensive review, in order to resolve many of the scheduling problems and financial risks encountered with the Part 50 licensing process. On the other hand, under the old Part 50 reactor licensing, the applicant would not be issued an operating license until after the nuclear plant is constructed and certified to comply with assurance of protection of public health and safety. The most beneficial use of Part 52 is when two of its major components are used together: the Design Certification and the COL. The most important component of Part 52 is the COL because it is the only license that allows plant construction and operation. The Part 52 COL allows early resolution of safety and environmental issues before the plant is constructed. When the COL is paired with a certified design, the reactor safety issues resolved by the design certification rulemaking process are not reconsidered during the COL review and are, therefore, not subject to adjudication during the COL licensing process. Moreover, the Part 52 licensing process allows for full public participation, so that the issues associated with the design and site can be resolved before construction begins.

III. 2000-2010: CONFLUENCE OF CONTRIBUTING FACTORS TO NEW NUCLEAR POWER DEVELOPMENT

Q. WHAT WERE THE FACTORS INFLUENCING NUCLEAR POWER DEVELOPMENT FROM 2000 TO THE ENACTMENT OF THE 2005 ENERGY POLICY ACT?

A. The operating nuclear industry had turned the corner by the turn of the century, with capacity factors of about 90 percent and low production costs.

1 The nuclear vendors were proposing Generation III+ reactors that exhibit
2 additional inherent safety and simplicity in construction and operation, with
3 Westinghouse applying in 1996 for design certification of its AP600 passive
4 safety features reactor and then introducing the upgraded AP1000 in 2002.
5 The NRC regulatory framework was more stable and dependable, reactor
6 licensing risk appeared to be reduced by the addition of Part 52, and overall
7 regulatory risk was decreasing. The environmental issues were favoring
8 nuclear power due to its environmentally benign footprint, near zero carbon
9 emissions, and effective carbon abatement. Supplies of uranium were well
10 established, diverse, and economical. The security issues raised by the
11 9/11/2001 terrorist attacks were well resolved by the NRC and the nuclear
12 power industry. Environmental considerations and the 2005 Clean Air rules
13 resulted in increased scrutiny and challenges to the continued dominance of
14 coal as the primary electricity producer. Increasing dependence on natural gas
15 was being questioned for its increasing price and especially for price volatility.
16 The electrical industry was emphasizing diversity and reliability for new base-
17 load capacity additions that would be strong contributors to long-term
18 electrical and gas price stabilization. Nuclear power appeared to fit the need,
19 and the political establishment responded with the Energy Policy Act of 2005
20 ("EPAC-05"), which contained a series of incentives for nuclear power
21 development.

1 **Q. HOW DID THE NUCLEAR POWER INDUSTRY RESPOND TO THE**
2 **CONFLUENCE OF FACTORS FAVORING DEVELOPMENT?**

3 A. The nuclear power industry responded by applying for new reactor licenses,
4 proposing the subsequent construction / operation of many new units, and
5 submitting the first new nuclear plant applications in three decades. Utilities
6 began working on license applications in 2005, mostly for Part 52 licensing,
7 with docketing at the NRC beginning in 2007. Five applications were
8 docketed in 2007, including DE Carolinas' application for the Lee Nuclear
9 Project. The industry accelerated planned nuclear development in 2008, with
10 an additional nineteen units applying for COLs, as shown on Exhibit NJD-2,
11 U.S. NRC: Expected New Nuclear Power Plant Applications (September 4,
12 2008). By the end of calendar year 2009, twenty companies had submitted
13 applications for thirty-one new nuclear units. Also, most of the operating
14 nuclear units in the country applied for twenty-year license extensions and
15 committed to substantial power upgrade investments. It is apparent that
16 utilities with significant nuclear power plant electrical generation experience
17 had studied the marketplace, technology, and regulatory framework and
18 decided that adding base-load nuclear power was in the best interest of their
19 customers. The majority of companies considering new nuclear are in the
20 Eastern Seaboard, where load demand projections, nuclear experience, and
21 economics were favorable to nuclear power expansion.

1 **Q. DID THE FAVORABLE ENERGY SCENARIO AND NUCLEAR**
2 **EXPANSION CONTINUE THROUGH THE END OF THE DECADE**
3 **AND BEYOND?**

4 A. No. There were multiple emerging energy, economic, and political factors that
5 impacted the nascent nuclear expansion. The so-called “Great Recession”
6 started in late 2007 and technically ended in June 2009. However, its impact
7 on the nation’s economics and energy development continued. One of the
8 major impacts of the Great Recession was the downturn of natural gas demand
9 and prices, which later coupled with the significant increase in the availability
10 of natural gas due to the introduction of hydraulic fracturing methods,
11 resulting in historically cheap and less volatile natural gas prices. Natural gas
12 prices had peaked in August 2005 at over \$18 per thousand cubic feet
13 (“Mcf”). Prices stood at \$14.76 per Mcf in June 2008 and were down to \$2.75
14 per Mcf in August 2009. Furthermore, the price has hovered in the range of \$3
15 to \$5 for the last seven years. The overall impact on the nation, especially on
16 the electricity generation market, has been dramatic. The extreme volatility of
17 natural gas prices had been a serious economic concern during the 2000-2010
18 decade, and concerns linger. However, the reality of much lower priced
19 natural gas, often predicted to remain below \$5 per Mcf for a couple of
20 decades, became a principal force in the electricity marketplace. Also, it
21 should be remarked that the issue of carbon regulatory uncertainty, especially
22 the potential for carbon tax, cap and trade, and other forms of regulating CO₂
23 that have been under consideration for years, has affected energy cost

1 projections. Nuclear power has been expecting to benefit from any form of
2 carbon regulation or taxation, but none has materialized. Moreover, the energy
3 scenario changed in a very short period of time. With natural gas prices down
4 and fluctuating within a reasonable range and production up about 50 percent
5 due to advanced hydraulic fracturing, natural gas became the fuel of choice
6 over coal. In addition, wind and solar power continued to make inroads as
7 sustainable electrical energy choices. The need for increased national security,
8 energy independence, and environmental stewardship contributed to the so-
9 called "American Energy Renaissance." By 2010 and beyond, the abundance
10 of cheap natural gas, aided by the surge of wind and solar power, was a
11 dominant force in the electricity marketplace. New nuclear power
12 development slowed when confronted with those issues and matters particular
13 to nuclear power deployment, especially the long time required for licensing
14 and construction. However, utilities with the strongest cases for nuclear power
15 deployment continued to pursue plant licensing to ensure the option for base-
16 load generation capacity, other than gas, was available when needed.

17 **Q. HOW DID THE NUCLEAR POWER INDUSTRY REACT TO THE**
18 **NEW ELECTRICITY MARKETPLACE EMERGING IN THE U.S.?**

19 A. The reaction of the nuclear industry, as shown in Exhibit NJD-3, U.S. NRC:
20 COL Applications Received through June 15, 2017, was mixed. Two primary
21 paths were chosen by the nuclear utilities that had applied for a license to the
22 U.S. NRC. Fourteen applicants decided to stop / suspend their license
23 applications, and fourteen applicants continued the effort to obtain a license

1 and conduct those activities necessary to preserve the option to build and
2 operate a nuclear power plant. The fourteen applicants suspending their COL
3 applications included merchant plants, which primarily existed in uncertain
4 and volatile electrical markets, some with COLAs referencing very complex
5 reactor designs without Design Certifications (the European Nuclear Reactor,
6 EPR). The fourteen applicants continuing to pursue the COL were in stable
7 electrical marketplaces with significant, dependable loads. The first two COL
8 recipients, Georgia Power and South Carolina Electric and Gas (“SCE&G”),
9 started nuclear construction for two units each immediately after receiving
10 their licenses, on 2/09/2012 and 3/30/2012, respectively, and right after the
11 AP1000 Design Certification Amendment was issued in December 2011.
12 Another six applicants have received a COL, with FP&L receiving the final
13 pending COL for Turkey Point Units 6 & 7 in April 2018. A total of ten
14 nuclear units maintain active COLs. Four nuclear units received COLs and
15 subsequently terminated their licenses. While the V.C. Summer COLs remain
16 active, construction has been cancelled for the two V.C. Summer AP1000
17 units. The strategy employed by the eight utilities (fourteen units) that pursued
18 the COLs and the capability to construct / operate nuclear power plants within
19 the framework established by Part 52 has been called the “value option.” A
20 COL, obtained after a long and exhaustive review process, is very valuable.
21 Its value is based on the fact that securing a license to construct / operate a
22 nuclear power plant enables the utility to select the time for construction that
23 is most beneficial to consumers without incurring the large expenditures

1 required for construction. The value intrinsic to the COL and the project
2 development effort, including the importance of a site licensed for large power
3 generation, is preserved for when the marketplace and financial conditions are
4 favorable to exercise the option.

5 **IV. ANALYSIS OF DE CAROLINAS' DECISION TO PURSUE A COL**
6 **FOR LEE NUCLEAR PROJECT**

7 **Q. WHAT WERE THE NUCLEAR MARKETPLACE CONDITIONS**
8 **SPECIFICALLY FAVORING PURSUING A COL BY DE CAROLINAS?**

9 A. At the time of DE Carolinas' application, the nuclear industry was
10 experiencing a renewal due to a number of factors, including regulatory
11 stability, safer and simpler reactor designs, projected increased energy
12 demand, high cost and high variability of natural gas prices, economic
13 incentives from EPAC-05, and a renewed focus on reducing carbon emissions.
14 Fuel diversification was important to utilities as a risk reduction strategy, as
15 was the long-term predictability of nuclear costs. As extensively discussed in
16 the previous section, there were multiple factors that made nuclear power a
17 viable and economic option to DE Carolinas when the company decided to
18 pursue new nuclear. Foremost, the selected Part 52 licensing process decreases
19 the risk by enabling the deferment of major investments until after issuance of
20 a COL. In simple terms, DE Carolinas did not have to make major
21 investments for nuclear power plant construction until they had a COL from
22 the NRC. The Lee Nuclear Project was being developed following well-
23 established management strategies to minimize financial risk to its customers.

1 **Q. WHAT SPECIFIC REGULATORY FACTORS CONTRIBUTED TO**
2 **THE DE CAROLINAS DECISION TO PURSUE A COL?**

3 A. By mid-2005, the NRC had done extensive work to be able to docket
4 applications for a COL under Part 52. The NRC-published schedule for a COL
5 license review was forty-two months. A timeframe of forty-eight months was
6 considered very probable. The NRC was quickly expanding its staff to support
7 the expected new applications and most of the supporting regulatory
8 framework had been or was being updated. The best approach to using the
9 new Part 52 licensing process and its risk-reducing features is to reference a
10 Standard Design Certification in a COL. This approach became available in
11 January 2006, when the NRC's Design Certification for Westinghouse's
12 AP1000 reactor was issued by rulemaking. The establishment of the AP1000
13 Design Certification provided the needed regulatory anchor to the COL,
14 enabling the full utilization of Part 52 reactor licensing. Also, the enacted
15 EPAC-05 included loan guarantees and production tax credits for a few new
16 nuclear plants.

17 **Q. WHAT INITIAL DECISIONS WERE MADE AND WHAT ACTIVITIES**
18 **WERE CONDUCTED BY DE CAROLINAS REGARDING THE**
19 **LICENSING OF THE LEE NUCLEAR PROJECT?**

20 A. DE Carolinas decided to pursue the preparation of a COLA in 2005 and
21 submitted it to the NRC on December 13, 2007. The application referenced
22 Revision 16 of the AP1000's Design Control Document ("DCD") of 2007. DE
23 Carolinas' COLA was found by the NRC staff to be suitable for review and

1 docketed on February 25, 2008. DE Carolinas established a project
2 management organization to actively pursue the COL and to conduct those
3 activities necessary to maintain its viability.

4 In order to ensure full disclosure of its activities and plans, and to
5 address their cost recovery needs, DE Carolinas applied to the Public Service
6 Commission of South Carolina ("PSCSC") for approval of its decision to
7 incur pre-construction costs. The PSCSC, after its requisite extensive review
8 of DE Carolinas' proposed licensing plan for the Lee Nuclear Project and with
9 due consideration of the benefits to South Carolina customers, issued two
10 orders approving pre-construction cost recovery as established in its June 9,
11 2008 *Order Approving Application of Duke Energy Carolinas' Decision to*
12 *Incur Nuclear Generation Pre-Construction Costs* and its July 1, 2011 *Order*
13 *Approving Amended Project Development Application and Settlement*
14 *Agreement*. DE Carolinas was issued a COL for the construction and operation
15 of the Lee Nuclear Project on December 19, 2016.

16 **Q. WAS DE CAROLINAS' DECISION TO START THE COLA EARLY**
17 **REASONABLE?**

18 A. Yes. It was well known to DE Carolinas that Part 52, although the best
19 licensing pathway available, was untested. Furthermore, long lead times have
20 been often associated with nuclear plant licensing. Many other utilities were
21 going to pursue COLs, and the number of COLAs under review was expected
22 to grow quickly. These uncertainties could hamper the development of a
23 nuclear project. Therefore, it was important to begin the licensing process

1 early enough to accommodate potential delays in order to exercise the license
2 when it was most beneficial to DE Carolinas customers.

3 **V. OBSTACLES TO LICENSING THE LEE NUCLEAR PROJECT**

4 **ON SCHEDULE**

5 **Q. WHAT WAS THE EXPECTED TIMEFRAME FOR AN APPLICANT**
6 **TO RECEIVE A COL WHEN DE CAROLINAS FILED ITS COLA?**

7 A. The NRC schedule called for an estimated forty-two months from docketing
8 to license, consistent with their schedule for the Design Certification.
9 However, it was expected in 2007 that forty-eight months was more probable
10 due to the large number of applications being docketed.

11 **Q. WHAT HAS BEEN THE ACTUAL EXPERIENCE OF UTILITIES**
12 **THAT HAVE OBTAINED A COL?**

13 A. The eight utilities pursuing fourteen COLs were divided into two groups for
14 the COLA reviews: Georgia Power (Vogtle plant) and SCE&G (Summer
15 plant) as lead plants and all the other applicants in a subsequent group.
16 Georgia Power and SCE&G had expressed their commitment to commence
17 construction right after issuance of the COL and were given preferential
18 review, as decided by the NRC Commissioners. The licenses for Summer and
19 Vogtle were issued in four years, essentially as scheduled. The other ten COLs
20 issued averaged 8.6 years from docketing to licensing. The Lee Nuclear
21 Project license was issued in nine years, slightly above the average. It appears
22 that all these utilities endured licensing delays from similar causes.

1 **Q. WHAT WERE THE SPECIFIC ISSUES THAT IMPACTED THE**
2 **TIMING FOR THE ISSUANCE OF THE LEE NUCLEAR PROJECT**
3 **COL?**

4 **A.** Two types of issues impacted timing of the issuance of the Lee Nuclear
5 Project COL: Issues directly related to NRC management of the licensing
6 review and issues related to DE Carolinas' improvements to the COLA from
7 voluntary and quasi-voluntary actions.

8 The individual impact of the issues discussed is difficult to quantify;
9 however, it is indisputable that each one of them and the aggregate resulted in
10 the licensing process taking significantly longer than originally anticipated for
11 the Lee Nuclear Project and other projects. The delay attributed directly to
12 issues dependent on the NRC management of the licensing review and issues
13 related to DE Carolinas improvements to the COLA are discussed below. It is
14 also important to note that the NRC must devote its attention to arising safety
15 issues for the operating nuclear plants, nuclear facilities, facilities under
16 construction, and other licensees prior to resolving new licensing issues. NRC
17 staff attention from 2010 to 2014 was frequently diverted from new reactor
18 licensing to other pressing safety-related matters. For example, the attention
19 that had to be devoted to the construction of the four AP1000 units at the
20 Vogtle and Summer sites, as ordered by the NRC Commission, reduced the
21 number of reviewers available for the Lee Nuclear Project licensing and
22 resulted in delays for DE Carolinas and the other applicants.

1 **A. Delays Related to the Yucca Mountain Licensing Review**

2 **Q. PLEASE EXPLAIN THE IMPACT OF THE YUCCA MOUNTAIN**
3 **LICENSING REVIEW.**

4 **A.** The Yucca Mountain licensing review took critical NRC staff away from
5 reactor licensing issues in the areas of seismic, geology, site characterization,
6 and environmental reviews. Since 2010, the review of the Yucca Mountain
7 licensing application has been stopped and then restarted, with complex legal
8 and budgeting issues complicating progress. Instabilities in the NRC's staffing
9 assignments occurred. Specifically, environmental, geologic and seismic
10 experts were diverted to these efforts, which lasted about four years. On
11 October 16, 2014, the NRC issued the very important Volume 3 of the Yucca
12 Mountain Safety Evaluation Report ("SER"), concluding that the design met
13 applicable performance objectives for safety following permanent closure of
14 the repository. On December 18, 2014, the staff issued Volume 4
15 (Administrative and Programmatic Requirements) of the SER, and on January
16 29, 2015, the staff issued the final parts of the review, Volume 2 (Repository
17 Safety Before Permit Closure) and Volume 5 (Proposed Conditions and
18 License Specifications), which completed the SER. Completion of these
19 reports allowed for the resumption of more standard review schedules after
20 2014. The Staff resource instability while the Yucca Mountain SER was being
21 prepared contributed to the delay in reactor licensing reviews.

B. Delays Related to the Waste Confidence Rule

Q. PLEASE PROVIDE MORE DETAILS ABOUT THE NRC'S WASTE CONFIDENCE RULE.

A. Between 1979 and 2010, the NRC established that spent nuclear fuel would be safely stored in a manner protecting public health and safety, the environment, and the common defense and security after the reactor's licensed life through a periodic generic determination of the issue, commonly known as the Waste Confidence Rule. The Waste Confidence Rule relied on confidence that the U.S. government will eventually establish a suitable repository for spent fuel. On December 23, 2010, the NRC published its most recently revised Waste Confidence Rule. This rule reaffirmed and amended the NRC's generic determinations regarding the environmental impacts of spent nuclear fuel storage at or away from reactor sites after the expiration of reactor operating licenses. In June 2012, the U.S. Court of Appeals for the D.C. Circuit vacated and remanded the NRC's Waste Confidence Rule. The Court held that the NRC must perform additional environmental reviews associated with the rule. The NRC suspended the issuance of new reactor licenses and license extensions that were reliant on this generic determination; however, the NRC continued the review of pending applications. Finally, the NRC issued the final Continued Storage of Spent Nuclear Fuel rule on August 26, 2014, significantly changing the considerations about the safety of continued storage of spent nuclear fuel to be independent of a national spent fuel repository. The ruling, made effective after publication in the Federal Register on September

1 19, 2014, effectively resolved the issues on the storage of spent fuel and ended
2 the power reactor licensing suspension. The new Continued Storage of Spent
3 Nuclear Fuel Rule adopts the findings from the new NRC generic
4 environmental impact statement; it establishes that spent nuclear fuel can be
5 safely managed in dry casks for the short-term (up to 60 years), the long-term
6 (another 100 years), and for indefinite time frames. The new rule does not
7 rely on the availability of a repository for the safe storage of spent fuel. The
8 two-year suspension of licensing provided another uncertainty and delay at a
9 time when the DE Carolinas COL review was advancing.

10 **C. Delays Related to the Fukushima Dai-ichi Accident**

11 **Q. PLEASE PROVIDE MORE DETAIL ABOUT THE FUKUSHIMA DAI-**
12 **ICHI ACCIDENT.**

13 **A.** On March 11, 2011, the Great East Japan Earthquake and subsequent tsunami
14 caused major loss of life and destruction of property in Japan. In addition, the
15 tsunami led to a series of flooding events that disrupted the electrical power
16 and equipment necessary to cool the reactors in three of the units in the
17 Fukushima Dai-ichi nuclear power plant. The lack of cooling capability, not
18 restored in time, resulted in the core meltdown and radioactivity releases from
19 units 1, 2, and 3 of the Fukushima plant. The global nuclear sector responded
20 immediately to this event with a reexamination of nuclear power plants
21 protection from large external events, especially from flooding.

1 **Q. WHAT WAS THE NRC’S RESPONSE TO THE FUKUSHIMA DAI-**
2 **ICHI ACCIDENT?**

3 A. The U.S. NRC responded immediately by assembling the Near-Term Task
4 Force (NTTF) to complete a Review of Insights from the Fukushima Dai-Ichi
5 Accident. The Task Force issued an insightful and far-reaching 2011 report on
6 “Recommendations for Enhancing Reactor Safety in the 21st Century”, which
7 mostly addressed issues pertinent to operating nuclear power plants. The
8 NRC, from the beginning of this new analysis of extreme external events,
9 concluded that the AP1000 passive-safety reactor selected for the Lee Nuclear
10 Project has significant and inherent safety enhancements that address many of
11 the Fukushima-related safety issues. AP1000 reactors only required review
12 and potential improvements in a few well-defined safety areas. The NRC has
13 stated that “all of the current COL and design certification applicants are
14 addressing new seismic and flooding requirements adequately in the context
15 of updated NRC guidance.”

16 **Q. WHAT WAS THE IMPACT OF THE FUKUSHIMA DAI-ICHI**
17 **ACCIDENT ON THE LEE NUCLEAR PROJECT?**

18 A. The NRC’s extensive regulatory review and requirements after the Fukushima
19 Dai-ichi accident disrupted the NRC license review sequencing and added a
20 few important issues to be considered in DE Carolinas’ COLA. As necessary
21 and required for a safety agency, the NRC was ensuring that all issues
22 potentially related to the Fukushima accident and external events in general
23 were thoroughly reviewed, and operating plants were clearly the priority.

1 Delays in new reactor licensing were inevitable. The actions specifically
2 required by the NRC for the Lee Nuclear Project, in accordance with the
3 Fukushima Near-Term Task Force recommendations, were dealt with during
4 the COLA review and incorporated into the license conditions, including: 1)
5 specific actions associated with the agency's post-Fukushima requirements for
6 mitigation strategies and spent fuel instrumentation; and 2) a pre-startup
7 schedule for post-Fukushima aspects of the new reactors' emergency
8 preparedness and procedures. These additions and the review of the operating
9 fleet also contributed to the delay of the issuance of the Lee COL.

10 **D. The Delay Related to Seismic Source Characterization**

11 **Q. PLEASE EXPLAIN THE NEW SEISMIC SOURCE**
12 **CHARACTERIZATION.**

13 A. By 2009, the NRC was actively reviewing the seismic models for the Central
14 and Eastern United States ("CEUS") Seismic Source Characterization for
15 Nuclear Facilities based on the known facts that ground motion effects could
16 be better characterized than in earlier NRC rules. After determining the best
17 methods to use, probabilistic assessments were incorporated into the models.
18 The NRC defined the CEUS project as follows: "The objective of the CEUS
19 SSC Project is to develop a new seismic source model for the CEUS using a
20 Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 assessment
21 process. The goal of the SSHAC process is to represent the center, body, and
22 range of technically defensible interpretations of the available data, models,

1 and methods. Input to a probabilistic seismic hazard analysis (PSHA) consists
2 of both seismic source characterization and ground motion characterization.”

3 **Q. WHAT IMPACT DID THE NEW SEISMIC SOURCE**
4 **CHARACTERIZATION HAVE ON THE LICENSING OF THE LEE**
5 **NUCLEAR PROJECT?**

6 A. The new NUREG-2115 “Central and Eastern United States Seismic Source
7 Characterization for Nuclear Facilities” was published in January 2012 and
8 was incorporated into the DE Carolinas’ license application for the Lee
9 Nuclear Project. It was another new issue to address in DE Carolinas’ COLA,
10 and licensing delays were incurred.

11 **Q. WHAT COMMON IMPACT DID THE YUCCA MOUNTAIN**
12 **LICENSING REVIEW, THE REMANDED WASTE CONFIDENCE**
13 **RULE, THE FUKUSHIMA DAI-ICHI ACCIDENT, AND THE CEUS**
14 **SEISMIC SOURCE HAVE ON THE LEE NUCLEAR PROJECT?**

15 A. Besides the above-described individual impacts from each one of these
16 occurrences, there is a significant cumulative and not well-quantified effect on
17 all the pending new reactor licenses. The NRC staffing and contractors work
18 was more affected in a common area: environmental, siting, geologic and
19 seismic reviews. Substitutions of experienced NRC staff or contractors
20 assigned to a project were not conducive to efficient reviews when
21 considering the sequencing and coordination of the licensing review steps
22 necessary to arrive at Final Safety Evaluation Reviews (FSERs), Final
23 Environmental Impact Statements, Final Safety Analysis Reports (FSARs),

1 Advisory Committee on Reactor Safeguards (ACRS) reviews with No Open
2 Items, and, finally, to the conduct of hearings and NRC Commission
3 Approval.

4 **E. Delays Related to Changes in Design Certification and Reference Plant**

5 **Q. PLEASE EXPLAIN THE IMPACT OF THE AP1000 DESIGN**
6 **CERTIFICATION AMENDMENT ON DE CAROLINAS' COLA**
7 **REVIEW.**

8 A. When DE Carolinas' COLA was docketed in 2008, it referenced the latest
9 DCD for the AP1000 Design Certification, Revision 16 ("Rev 16"). In
10 December 2011, about four years after DE Carolinas' COLA submittal,
11 Westinghouse obtained approval for the "final" upgrade of its design
12 certification, docketed as Revision 19 ("Rev 19") to the DCD. It was
13 suggested by the NRC that utilities referencing Rev 16 could benefit by
14 changing its COLA to reference Rev 19 of the AP1000 DCD; the Design-
15 Centered Review Approach group would be able to maintain a common DCD
16 for their applications review. DE Carolinas changed its COLA to reference
17 Rev 19 of the AP1000 by submitting Revision 4 of the COLA on 7/29/2011. It
18 should be remarked that the COLA must also describe the Inspections, Tests,
19 Analyses, and Acceptance Criteria ("ITAAC") that are necessary to ensure
20 that the plant has been properly constructed and will operate safely. When the
21 application references a standard design certification, the applicant must
22 perform the ITAAC for the certified design and the site-specific design
23 features. Any changes must be reflected in the ITAACs. The change to DCD

1 Rev 19 required modification of DE Carolinas' COLA, including ITAACs,
2 necessitating subsequent adjustments, NRC questions, and NRC interactions.
3 The challenges with the design certification amendment and the external
4 factors discussed above occurred generally between 2010 and 2015, which
5 was the most critical period for advancing the NRC's review of the Lee COL
6 application, and directly resulted in the delay of the NRC's issuance of the
7 Lee COL.

8 **F. DE Carolinas' Improvements to the COLA**

9 **Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT DE**
10 **CAROLINAS' DECISION TO CHANGE THE LOCATION OF THE**
11 **REACTOR.**

12 A. DE Carolinas determined that the Lee nuclear reactor would be better
13 anchored at a different location than the one initially selected for the COLA.
14 My review of the Company's decision to change the location of the reactor
15 indicates that this decision was a cost-effective change that would result in
16 improved reactor building stability and more economic construction.
17 However, a change to the COLA was necessary. Any COLA change requires
18 preparation, review, and additional time.

19 **Q. WHAT WERE THE BENEFITS OF THIS DECISION?**

20 A. The benefits of this decision are first found in the NRC staff review of the Part
21 100 - Reactor Site Criteria, minimizing challenges by the staff and promoting
22 efficiencies in the review. Also, it is significantly beneficial for the
23 determination of the reactor site excavation, concrete foundation, and

1 placement of other buildings. It would pay off in the cost of the plant
2 construction.

3 **Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE**
4 **CAROLINAS' DECISION?**

5 A. It was reasonable and prudent for the reasons discussed above.

6 **Q. PLEASE EXPLAIN DE CAROLINAS' DECISION WITH RESPECT**
7 **TO ADDING A MAKE-UP POND.**

8 A. DE Carolinas' decision to add a make-up pond for cooling water to the Lee
9 Nuclear Project was based on the limited amount of water in the Ninety-Nine
10 Islands Reservoir, the main cooling water source for the plant. The limitation
11 was made evident during the drought of 2007-2008. The make-up pond, not a
12 safety-related system, was deemed appropriate to maintain the plant's rated
13 power and avoid interfering with the operations of dams and the water
14 supplies of adjacent communities.

15 **Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE**
16 **CAROLINAS' DECISION?**

17 A. It was a reasonable and prudent decision considering the circumstances
18 established by the above-discussed issues emphasizing availability of water
19 for plant cooling, dams, and town consumption during droughts.

20 **Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT DE**
21 **CAROLINAS' DECISION TO CHANGE THE COOLING TOWERS.**

22 A. In December 2011, DE Carolinas decided to submit an amendment to the
23 COLA revising the cooling tower design for the Lee Nuclear Project. After an

1 optimization study and alignment of the design to the Summer units' cooling
2 towers, DE Carolinas changed the cooling water supply to the Component
3 Cooling Water System ("CCWS") design from three to two cooling towers per
4 unit to improve the basins, site flooding resistance, as well as to improve the
5 overall reliability of the CCWS. These changes were responsive to an NRC
6 Request for Additional Information ("RAI").

7 **Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE**
8 **CAROLINAS' DECISION TO CHANGE THE COOLING TOWERS?**

9 A. It was a reasonable and prudent decision to improve the project design, the
10 site characterization, as well as to provide appropriate response to the NRC in
11 the post-Fukushima flooding concerns arena.

12 **G. Overcoming the Challenges of Part 52**

13 **Q. WHAT EFFECT DID THE USE OF PART 52 HAVE ON THE LEE**
14 **NUCLEAR PROJECT?**

15 A. The use of Part 52 licensing has proven to be difficult for DE Carolinas and
16 the other applicants seeking a COL referencing a Design Certification. It has
17 also proven difficult at the construction stage, as evidenced by the projects at
18 Vogtle and Summer. Moving from Part 50 to Part 52 introduced many new
19 processes and strict control for departures from the Design Certification.
20 Conformance with the DCD of the certified design and the COL finality
21 requires meeting codes and standards prior to issuance, among other rigid
22 processes. Changes have been controlled by conservative NRC Staff
23 interpretations on some DCD documents that were not well defined.

1 Specifically, all design-related information in the so-called Tier 1 of the DCD
2 is well-controlled since it is established by rulemaking and can only be
3 changed by rulemaking. However, the design-related information contained in
4 Tier 2 of the DCD, which supports the Tier 1 information, is approved but not
5 certified by rulemaking. Changes to and departures from Tier 2 are strictly
6 governed by Appendix D to Part 52, Section VIII. Furthermore, a part of Tier
7 2, designated as Tier 2*, is treated separately and was supposed to provide
8 flexibility to applicants to make changes by using license amendments. In this
9 way, changes to important design methodologies and improvements in
10 technology could be accommodated but would be subject to review. At the
11 beginning, three or four such areas of improvements were believed to be in the
12 scope of Tier 2* design-related information. Eventually, twenty-four such
13 areas were designated AP1000 Tier 2*. Change processes have been therefore
14 cumbersome and time consuming, adding to the licensing delays. I believe
15 that the licensing process established by Part 52 is the best option for licensing
16 a nuclear power plant, but it needs improvements for better implementation
17 while maintaining the public health and safety, protecting the environment,
18 and the common defense and security. Moreover, implementation of Part 52
19 has been difficult for the lead plants, especially with regard to the completion
20 of the detailed design. This issue is one of the most important to resolve for
21 new nuclear plants in the US and abroad.

1 **Q. PLEASE PROVIDE AN EXPLANATION OF DE CAROLINAS'**
2 **MANAGEMENT OF RAIS AND GENERIC DESIGN CERTIFICATION**
3 **ISSUES.**

4 A. It is common to encounter a significant amount of additional and often
5 unexpected work when responding to RAIs from the NRC. For the Lee
6 Nuclear Project COLA review, this process was more arduous because the
7 implementation of Part 52 was still developing and other issues, such as the
8 Waste Confidence Rule and the Fukushima Daiichi accident, required the
9 attention of the NRC Commission and Staff. Also, there were errors and
10 changes to the AP1000 DCD and ongoing refinement or changes to seismic
11 and geologic, instrumentation and control, control room, and emergency
12 planning, as well as other emerging issues. AP1000 generic issues were being
13 resolved after the Design Certification, and these standardization and finality
14 reviews and changes took additional time. The changeover from Rev 16 to
15 Rev 19 was not complicated, but it also took additional time, as did the
16 seismic re-analysis resulting from NUREG-2115.

17 **Q. PLEASE CITE ANOTHER SPECIFIC ISSUE WITH THE AP1000 DCD**
18 **THAT IMPACTED THE DE CAROLINAS COL ISSUANCE.**

19 A. Late in its review of DE Carolinas' COLA, in September 2014, the NRC
20 notified the Lee Nuclear Project reference plant (Levy Nuclear Plant) of
21 design errors in Westinghouse's DCD Rev 19. These errors tripped the
22 thresholds established in Interim Staff Guidance ("ISG-11"), which clarifies
23 the NRC staff's position regarding the finalization of licensing basis

1 information for COL applicants. The above-referenced issues included
2 handling of combustible gas controls, main control room (“MCR”) heat-up,
3 habitability, dose responses and condensate return. This ISG-11 issue involved
4 all COL applicants in the Design Review Group, and it took a year to receive
5 clarification from the NRC to address how COL applicants could best resolve
6 generic errors in certified designs. The complexity of the issues and the
7 constraints from “design finality” required a major effort by Lee Nuclear
8 Project licensing management to address and eventually endorse the reference
9 plant’s gas control, habitability, flux doubling, MCR dose, and condensate
10 return responses to the NRC. The effort was completed in February 2016,
11 some seventeen months after the issue was identified.

12 **Q. HOW EXTENSIVE AN EFFORT WAS REQUIRED FOR DE**
13 **CAROLINAS TO RESPOND TO RAIS REGARDING THE LEE**
14 **NUCLEAR PROJECT?**

15 A. As discussed above, the effort was extensive, continuous, and time-
16 consuming.

17 **Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE**
18 **CAROLINAS’ MANAGEMENT OF THESE ISSUES?**

19 A. DE Carolinas’ management of these issues was reasonable and prudent. DE
20 Carolinas’ approach was consistent with effective practices to respond to NRC
21 inquiries as needed for the NRC to complete its review.

1 **Q. WERE THERE OTHER ISSUES THAT MAY HAVE CONTRIBUTED**
2 **TO THE TIME REQUIRED TO OBTAIN A COL FOR THE LEE**
3 **NUCLEAR PROJECT?**

4 A. I am certain that the issues discussed above are a representative sample of the
5 many challenges encountered by DE Carolinas in the resolution of issues
6 required to obtain a COL from the NRC. Other issues, whose impact are not
7 well characterized, occurred during the NRC review process in the period
8 under consideration, to include turnover at the Commission level and senior
9 NRC staff. Also, other agencies have corresponding or specific
10 responsibilities with respect to plans for nuclear plant construction. For
11 instance, the U.S. Army Corps of Engineers (USACE), the U.S.
12 Environmental Protection Agency (EPA), the U.S. Forest Service, the South
13 Carolina Department of Health and Environmental Control, and other local
14 agencies had their own set of permit issues. In summary, it would be
15 demanding to license a power reactor under normal circumstances. The period
16 2008-2016 was not normal, as explained in detail above. Consequently, the
17 issuance of the Lee Nuclear Project COL was delayed well beyond original
18 expectations.

19 **Q. COULD THE WASTE CONFIDENCE RULE, FUKUSHIMA, CEUS,**
20 **WESTINGHOUSE DESIGN CHANGES, AND PART 52 ISSUES HAVE**
21 **BEEN PREDICTED BEFOREHAND TO DELAY THE RECEIPT OF**
22 **THE LICENSE BY FOUR TO FIVE YEARS?**

23 A. No.

VI. REVIEW OF DE CAROLINAS COL AND PROJECT-RELATED DECISIONS AND COSTS

Q. HAVE YOU REVIEWED THE COST BREAKDOWN FOR THE COL AND PROJECT-RELATED COSTS THAT DE CAROLINAS IS SEEKING APPROVAL TO RECOVER?

A. Yes. I have reviewed summary information provided by DE Carolinas for different time periods of the project, including filings for cost recovery with the North Carolina Utilities Commission and the PSCSC. It is my understanding that DE Carolinas is seeking to recover approximately \$518 million for the entire licensing project, which includes \$270 million for project expenses and \$248 million for AFUDC. FP&L has reported expenditures to the FPSC of \$267 million for the site selection and pre-construction (exclusive of financing charges) as of December 31, 2017. The \$270 million for site and pre-construction costs, including COL maintenance costs, incurred by DE Carolinas in this case compares well to the amount of cost incurred by FP&L for similar work conducted for Turkey Point Units 6 and 7.

Q. WHAT WOULD HAVE BEEN THE DISADVANTAGES OF SUSPENDING EFFORTS TO LICENSE THE LEE NUCLEAR PROJECT AND RESTARTING THIS EFFORT AT A SUBSEQUENT TIME?

A. The disadvantages include the difficulty and cost related to suspending the COLA, the effort and cost of re-starting it when potentially facing changes to the overall regulatory framework, and losing a dedicated expert management

1 and staff group at the NRC cognizant of the Lee Nuclear Project. Moreover,
2 the main disadvantage would be not having a readily-executable license to
3 construct and operate the Lee Nuclear Project at the time most favorable for
4 DE Carolinas customers.

5 **Q. WHAT IS THE VALUE TO DE CAROLINAS OF HAVING A COL FOR**
6 **THE LEE NUCLEAR PROJECT?**

7 A. The value of DE Carolinas' COL includes its intrinsic importance in the
8 capability of deploying a nuclear power plant when most beneficial for a
9 licensed life of forty years, with the possibility of additional license renewals.
10 The COL is a readily available asset for DE Carolinas. It includes a very
11 valuable, environmentally-screened tract of land and cooling water, quite
12 suitable for large power generation.

13 **Q. PLEASE PROVIDE SOME ADDITIONAL DETAILS ABOUT WHY**
14 **THE LEE NUCLEAR PROJECT REMAINS VALUABLE.**

15 A. The value of the Lee Nuclear Project derives primarily from two substantive
16 assets: the Lee COL issued by the NRC and the availability of an
17 environmentally suitable site, with the requirements for large power
18 generation, already studied and approved.

19 **Q. WHY DOES THE LEE COL REMAIN A VALUABLE ASSET?**

20 A. The Lee COL enables DE Carolinas to build two AP1000 units on the Lee
21 Nuclear Project site if DE Carolinas chooses to do so. As I explain in more
22 detail above, the value of a COL for the construction and operation of an
23 advanced passive safety nuclear power reactor lies in its durability, finality,

1 and capability to be executed when the licensee determines it is in the best
2 interest of its customers.

3 **Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT HOW**
4 **PART 52 LIMITS REGULATORY CHANGES TO THE LEE COL.**

5 A. The finality of the COL is strictly established by 10 C.F.R. § 52.98, especially
6 at § 52.98 (a): “After issuance of a combined license, the Commission may
7 not modify, add, or delete any term or condition of the combined license, the
8 design of the facility, the inspections, tests, analyses, and acceptance criteria
9 contained in the license which are not derived from a referenced standard
10 design certification or manufacturing license, except in accordance with the
11 provisions of § 52.103 or § 50.109 of this chapter, as applicable.” Moreover,
12 the issues that are resolved in a standard design certification ruling are also
13 subjected to a very strict change process, and the NRC can only modify a
14 certified design under very limited circumstances, such as if the NRC finds
15 that the design does not meet the applicable regulations in effect at the time of
16 the Design Certification, or if it is necessary to modify the design to assure
17 adequate protection of the public health and safety, as established in 10 C.F.R.
18 § 52.63. Even if the Design Certification changes or expires, DE Carolinas
19 can select to construct and operate the Lee Nuclear Project as licensed as of
20 December 19, 2016, including specified license conditions and accepted
21 recommendations. The capability to construct and operate as licensed is a key
22 feature and advantage of the finality rules of 10 C.F.R. Part 52. In this regard,
23 it is notable that the Tennessee Valley Authority (“TVA”) received a 1973

1 construction permit under 10 C.F.R. Part 50 for Watts Bar Unit 2, stopped
2 construction in 1985, and reinitiated construction in 2007 under an extended
3 construction permit. The NRC issued TVA a 10 C.F.R. Part 50 operating
4 license for Watts Bar Unit 2 in 2015, and Watts Bar Unit 2 is currently in
5 service. The Lee COL, which was issued pursuant to 10 C.F.R. Part 52,
6 provides greater certainty with respect to the finality and capabilities of the
7 license than was afforded to TVA under its 10 C.F.R. Part 50 construction
8 permit.

9 **Q. WHAT ARE THE BENEFITS OF HAVING THE LEE NUCLEAR**
10 **PROJECT AS AN ENVIRONMENTALLY-SCREENED SITE?**

11 A. The value of the Lee Nuclear Project as an environmentally-screened site is
12 that the site has been rigorously examined and determined to be suitable to
13 sustain a nuclear power plant. This determination includes the site's geology /
14 hydrology / seismology / meteorology characteristics, population density and
15 nearby man-made infrastructures, access roads and land improvements, and
16 the valuable cooling water in compliance with national and regional use
17 requirements. These determinations are supported by the record of decisions
18 compiled over a decade of work.

19 **Q. HOW DO THESE FACTORS MAKE THE LEE NUCLEAR PROJECT**
20 **VALUABLE?**

21 A. Having completed the significant technical effort that was required to
22 characterize the site and obtain many of the regulatory approvals that are
23 required to build and operate a nuclear power plant on the site, DE Carolinas

1 now has the option to execute the Lee Nuclear Project if and when the time is
2 right. This factor makes the Lee Nuclear Project an asset of considerable
3 value to DE Carolinas' customers.

4 **Q. WHAT ARE THE ADVANTAGES OF THE LICENSING-FIRST**
5 **APPROACH TAKEN BY DE CAROLINAS?**

6 A. The advantages of the licensing-first approach taken by DE Carolinas rest on
7 the capability for DE Carolinas' management to review the costs and risks of
8 the Lee Nuclear Project as the design develops to ensure the viability of
9 initiating nuclear construction, while proceeding at a pace where DE
10 Carolinas could benefit from the lessons learned of other utilities also
11 pursuing new nuclear generation. More importantly, DE Carolinas customers
12 will have the advantage of having a license that will reduce significantly the
13 lead time necessary to build and construct a future nuclear unit if there is a
14 decision to go forward with the construction of a nuclear facility in the future.

15 **Q. WAS THE SELECTION OF THE AP1000 DESIGN REASONABLE,**
16 **WHEN CONSIDERING THE PROBLEMS ULTIMATELY**
17 **ENCOUNTERED WITH THE LICENSING AND THE**
18 **CONSTRUCTION OF AP1000 REACTORS?**

19 A. Yes. The AP1000 design was and I believe continues to be the best reactor
20 technology available, with the most advanced safety features and potential for
21 economic deployment. Most of the proximate causes of rising cost and
22 construction delays associated with new nuclear builds in the United States
23 are attributable to the thirty-year hiatus in U.S. nuclear construction, not the

1 novelty of the AP1000 design. The significant problems with the Vogtle and
2 Summer units are construction problems, beginning with the lack of extensive
3 detailed design prior to and after construction startup, the introduction of
4 modular construction, the construction management organization, the
5 scheduling, the labor force, the supply chain, and changes thereto. These
6 issues would be addressed prior to a decision to construct and operate by any
7 of the utilities holding COLs that have not yet undertaken construction. DE
8 Carolinas customers have been protected from potential cost overruns and
9 delays from moving first in a restarted industry like new nuclear construction.
10 However, by having a COL, DE Carolinas is still in a position to pursue new
11 nuclear if and when it becomes appropriate to do so for its customers.

12 **Q. WHAT IS THE NEAR-TERM IMPACT OF THE WESTINGHOUSE**
13 **BANKRUPTCY, DISCONTINUATION OF CONSTRUCTION WORK,**
14 **AND THE FINANCIAL ISSUES WITH THE SOUTH CAROLINA AND**
15 **GEORGIA POWER PLANTS?**

16 A. The impact of the above issues during most of 2017 were disruptive for the
17 South Carolina and Georgia plants' construction, as well as increasing
18 uncertainty and risk for other near-term nuclear plant construction. With
19 Westinghouse's bankruptcy and its exiting the construction business, it
20 became critical to re-evaluate project execution strategies for new nuclear and
21 how engineering, procurement and construction would be undertaken to
22 adhere to a reliable cost and schedule.

1 The construction of the South Carolina (SCE&G and Santee Cooper)
2 nuclear power plant stopped shortly after the Westinghouse announcements.
3 In July 2017, SCE&G and Santee Cooper announced that they would abandon
4 the V.C. Summer Units 2 and 3 project. In December 2017, SCE&G applied to
5 the NRC to suspend the COL licenses for VC Summer Units 2 & 3.

6 On the other hand, with many difficulties, the construction of the
7 Vogtle Nuclear Power Plant (“NPP”) is continuing with support from the
8 federal government and approval in December 2017 by the Georgia Public
9 Service Commission. The Vogtle NPP will receive federal production tax
10 credits after it achieves commercial operation. Furthermore, a conditional
11 commitment for additional loan guarantees from the Department of Energy
12 would add \$3.7 Billion to the companies supporting the construction: \$1.67
13 Billion for Georgia Power, \$1.6 Billion for Oglethorpe Power Corp., and \$415
14 Million for the Municipal Electric Authority of Georgia for the construction of
15 the two reactors. Construction has continued at Vogtle, with over 6,000
16 workers presently at the plant, with completion expected for Vogtle Units 3
17 and 4 by 2021 and 2022 respectively.

18 In the international arena, Westinghouse’s AP1000 nuclear reactors in
19 China are achieving significant milestones. Sanmen Unit 1 was connected to
20 the electrical grid on June 30, 2018, and entered commercial operation on
21 September 21, 2018. In addition, Sanmen Unit 2 was connected to the grid in
22 August and is expected to enter commercial operation before the end of 2018.
23 The other two AP1000 units in Haijiang are also achieving operational

1 milestones, with Haijang 1 already connected to the grid and expected to be in
2 commercial operation by December 2018. Haijang 2 is expected to be in
3 commercial operation before mid-year 2019.

4 It is important to note that the acquisition of Westinghouse by
5 Brookfield Business Partners LP's has been finalized and Westinghouse has
6 exited bankruptcy. These developments are very important news for existing
7 Westinghouse customers and their nuclear businesses, as Westinghouse is still
8 the largest provider of nuclear services in the world.

9 Furthermore, the U.S. Department of Energy is strongly supporting the
10 sale of six nuclear units by Westinghouse to India, and federal efforts continue
11 to support the important role of nuclear power for the USA security, stability,
12 contribution to amelioration of carbon releases, and long-time economics.

13 **Q. WHAT MUST DE CAROLINAS DO TO MAINTAIN THE COL**
14 **FOLLOWING ITS ISSUANCE?**

15 A. DE Carolinas must conduct those activities necessary to ensure the issued
16 COL continues to be protective of the safety and health of the public, the
17 environment, and the common defense and security in a manner consistent
18 with NRC regulations. The COL is valid for forty years from the date the
19 Commission finds the acceptance criteria were met under 10 CFR §
20 52.103(g). Presently, the COL can be renewed for an additional twenty years,
21 following a well-established process. The maintenance efforts and costs are
22 minimal until the decision to proceed with the construction is made.
23 Additional revisions and costs could be incurred if the NRC determines that a

1 safety issue needs to be reviewed and incorporated into the license, but these
2 costs would not expected to be significant since they would likely be covered
3 under a Design Certification Amendment.

4 **VII. CONCLUSIONS**

5 **Q. BASED ON YOUR REVIEW OF THE LEE COLA PROCESS,**
6 **INCLUDING DELAYS, AND WITH CONSIDERATION OF ALL**
7 **IMPORTANT FACTORS AFFECTING THE REVIEW SCHEDULE,**
8 **WERE THE DE CAROLINAS DECISIONS AND ACTIONS**
9 **REASONABLE?**

10 A. Yes. Based on my experience, a review of DE Carolinas' decisions and actions
11 leads me to conclude that the stepwise approach to licensing and managing the
12 project for the Lee Nuclear Project, and its decision to extend their target
13 operation dates, are reasonable and consistent with industry best practices.
14 Decisions were made to conduct necessary activities and to defer others, in
15 accordance with the primary decision to obtain a license. For example, DE
16 Carolinas made conscious decisions to defer certain long-lead procurement
17 decisions and did not enter into an Engineering, Procurement, and
18 Construction contract for the project. By choosing to reserve these
19 expenditures until a later time, DE Carolinas showed sound risk management
20 and will be able to make these decisions with the appropriate information in
21 the future. It has preserved the option for future nuclear generation for its
22 customers, with a license that can be exercised when the energy and economic
23 conditions are favorable for base-loaded nuclear electricity generation.

1 **Q. PLEASE PROVIDE YOUR OVERALL CONCLUSION OF THE**
2 **PROJECT COSTS INCURRED FOR THE LEE NUCLEAR PROJECT.**

3 A. I find that the project costs incurred for the Lee Nuclear Project are reasonable
4 and prudent. The elevated AFUDC costs are due to the protracted proceedings
5 to obtain the COL license; the multiple causes for the delay are well justified
6 in the preceding discussions. I believe that DE Carolinas took technically and
7 financially sound steps to enable the licensing and project activities for the
8 Lee Nuclear Project.

9 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

10 A. Yes.

Exhibit NJD-1

Summary Resume of Nils J. Diaz, PhD

Dr. Nils J. Diaz is the Managing Director of The ND2 Group, an expert and policy advisor group with a strong focus on the national and international nuclear power development and deployment arena, and the Chief Strategic Officer of Blue Castle Holdings, Inc., an energy development corporation. He served as Commissioner, Florida Energy and Climate Commission, October 2008-October 2010.

Nils Diaz is a past Chairman of the U.S. Nuclear Regulatory Commission (NRC). Dr. Diaz was designated Chairman of the NRC by President Bush on April 1, 2003 and he served as such until his retirement from government service on June 30, 2006. As Chairman of the NRC, Dr. Diaz served as the principal executive officer of and the official spokesman for the NRC, and was responsible for the initiation and ultimate execution of the Agency's budget, and Congressional and international relations. Dr. Diaz was a Commissioner of the U.S. NRC for two consecutive 5-year Senate – confirmed appointments, including his years as Chairman of the Commission, beginning in 1996. As a member of the Commission, Dr. Diaz had responsibility for setting policy and rulemaking direction for the broad and diverse activities within the Commission's charter, including nuclear power reactors and nuclear fuel facilities, medical and industrial uses of radioisotopes, disposition of high-level and other radioactive wastes.

Prior to his appointment to the NRC, Dr. Diaz was the Director (1985-1996) of a national consortium for advanced nuclear power and propulsion (INSPI) for the Ballistic Missile Defense Organization (BMDO), Department of Defense, and Professor of Nuclear Engineering Sciences at the University of Florida (1969-1996). As a Director for BMDO, he exercised prime contractor management and Lead Scientist responsibilities for a diverse group of industries (including Aerojet, Boeing, Pratt & Whitney, Hughes Electronics, Rocketdyne and SRI), several national laboratories (including Los Alamos NL, Sandia NL, and Lawrence Livermore NL) and seven major universities, under contracts with the Department of Defense, the Defense Nuclear Agency, the Department of Energy and NASA. Dr. Diaz spent the majority of his academic service at the University of Florida, and was made Full Professor and Director in 1979. He holds multiple patents with the University of Florida and presently holds the rank of Professor Emeritus at the University of Florida. In 2005, he was awarded the University of Florida Distinguished Alumnus Award.

Dr. Diaz has held senior positions at several national advisory boards, and consulted for the U.S. Government, other governments, and major nuclear vendors and architect/engineers. He has owned or co-owned eight small corporations serving nuclear power and advanced information technology areas, and spent six years at nuclear utilities and reactor vendors resolving major technical and management performance issues.

Dr. Diaz is internationally recognized for his broad expertise and contributions to nuclear sciences, reactor systems and fuels, to the regulation of nuclear facilities and radioactive materials, to the development of nuclear policy and deployment infrastructure. He has worked extensively in nuclear policy development in both the national and international arena, including interacting and contributing to major nuclear deployment policy, forums and decision-making efforts focusing on energy infrastructure development. From 1969 to 1996, and from 2006 to 2017, Dr. Diaz held senior positions at several national advisory boards, and consulted for the U.S. Government, other governments, and major nuclear vendors and architect/engineers on civilian nuclear energy deployment.

Dr. Diaz holds a Ph.D. and M.S. in Nuclear Engineering Sciences from the University of Florida, and a B.S. Degree in Mechanical Engineering from the University of Villanova, Havana. He was licensed as a Senior Reactor Operator by the NRC and has formal training and practice in health physics, radiological sciences and nuclear medicine. He is a Fellow of the American Nuclear Society, the American Society of Mechanical Engineers, and the American Association for the Advancement of Sciences. He recently chaired the ASME Presidential Task Force in response to the Fukushima accidents. He has been recognized worldwide for his statesmanship on nuclear affairs, including chairing the G8Nuclear Summit in Russia and leading the US Delegation to the International Atomic Energy Agency General Conference in 2005. He has received many national and international awards, including the Henry DeWolf Smyth 2008 Nuclear Statesman Award, awarded by the Nuclear Energy Institute, representing the nuclear industry, and by the American Nuclear Society. Dr. Diaz has been elected a Member of the Hispanic Hall of Fame and recognized as one of the top 50 Hispanics in Sciences and Engineering, and was named the National Hispanic Scientist of the Year for 2009.

October 2018

Expected New Nuclear Power Plant Applications
Updated September 4, 2008

Company*	Date of Application	Design	Date Accepted	Site Under Consideration	State	Existing Operating Plant
Calendar Year (CY) 2007 Applications						
NRG Energy (52-012/013)	09/20/2007	ABWR	11/29/2007	South Texas Project (2 units)	TX	Y
NuStart Energy (52-014/015)	10/30/2007	AP1000	01/18/2008	Bellefonte (2 units)	AL	N
UNISTAR (52-016)	07/13/2007 (Envir.) 03/13/2008 (Safety)	EPR	01/25/2008	Calvert Cliffs (1 unit)	MD	Y
Dominion (52-017)	11/27/2007	ESBWR	01/28/2008	North Anna (1 unit)	VA	Y
Duke (52-018/019)	12/13/2007	AP1000	02/25/2008	William Lee Nuclear Station (2 units)	SC	N
2007 TOTAL NUMBER OF APPLICATIONS = 5 TOTAL NUMBER OF UNITS = 8						
Calendar Year (CY) 2008 Applications						
Progress Energy (52-022/023)	02/19/2008	AP1000	04/17/2008	Harris (2 units)	NC	Y
NuStart Energy (52-024)	02/27/2008	ESBWR	04/17/2008	Grand Gulf (1 unit)	MS	Y
Southern Nuclear Operating Co. (52-025/026)	03/31/2008	AP1000	05/30/2008	Vogtle (2 units)	GA	Y
South Carolina Electric & Gas (52-027/028)	03/31/2008	AP1000	07/31/2008	Summer (2 units)	SC	Y
AmerenUE (750)	07/24/2008	EPR		Callaway (1 unit)	MO	Y
Progress Energy (756)	07/30/2008	AP1000		Levy County (2 units)	FL	N
Exelon (761)	09/03/2008	ESBWR		Victoria County (2 units)	TX	N
Entergy (745)		ESBWR		River Bend (1 unit)	LA	Y
PPL Generation (762)		EPR		Bell Bend (1 unit)	PA	Y
UNISTAR (759)		EPR		Nine Mile Point (1 unit)	NY	Y
Luminant Power (754)		USAPWR		Comanche Peak (2 units)	TX	Y
Detroit Edison (757)		ESBWR		Fermi (1 unit)	MI	Y
Alternate Energy Holdings (765)		EPR		Bruneau (1 unit)	ID	N
2008 TOTAL NUMBER OF APPLICATIONS = 13 TOTAL NUMBER OF UNITS = 19						
Calendar Year (CY) 2009 Applications						
Florida Power and Light (763)		AP1000		Turkey Point (2 units)	FL	Y
Amarillo Power (752)		EPR		Vicinity of Amarillo (2 units)	TX	UNK
2009 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 4						
Calendar Year (CY) 2010 Applications						
Blue Castle Project		TBD		Utah	UT	N
Unannounced		TBD		TBD	TBD	UNK
Unannounced		TBD		TBD	TBD	UNK
2010 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 4						
2007 – 2010 Total Number of Applications = 23 Total Number of Units = 34						

*Project Numbers/Docket Numbers

Yellow – Acceptance Review Ongoing

Blue – Accepted/Docketed

U.S. NRC: COL Applications Received through April 25, 2018

Proposed New Reactor(s)	Design	Applicant	Status
Bell Bend Nuclear Power Plant	U.S. EPR	PPL Bell Bend, LLC	Withdrawn
Bellefonte Nuclear Station, Units 3 and 4	AP1000	Tennessee Valley Authority (TVA)	Withdrawn
Callaway Plant, Unit 2	U.S. EPR	AmerenUE	Withdrawn
Calvert Cliffs, Unit 3	U.S. EPR	Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC	Withdrawn
Comanche Peak, Units 3 and 4	US-APWR	Luminant Generation Company, LLC (Luminant)	Suspended
Fermi, Unit 3	ESBWR	Detroit Edison Company	Issued
Grand Gulf, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Withdrawn
Levy Nuclear Plant, Units 1 and 2	AP1000	Duke Energy Florida, LLC (DEF)	Issued
Nine Mile Point, Unit 3	U.S. EPR	Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC (UniStar)	Withdrawn
North Anna, Unit 3	ESBWR	Dominion Virginia Power (Dominion)	Issued
River Bend Station, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Withdrawn
Shearon Harris, Units 2 and 3	AP1000	Progress Energy Carolinas, Inc. (PEC)	Suspended
South Texas Project, Units 3 and 4	ABWR	Nuclear Innovation North America, LLC (NINA)	Issued
Turkey Point, Units 6 and 7	AP1000	Florida Power and Light Company (FPL)	Issued
Victoria County Station, Units 1 and 2	ESBWR	Exelon Nuclear Texas Holdings, LLC (Exelon)	Withdrawn

U.S. NRC: COL Applications Received through April 25, 2018

Proposed New Reactor(s)	Design	Applicant	Status
Virgil C. Summer, Units 2 and 3	AP1000	South Carolina Electric & Gas (SCE&G)	Issued
Vogtle, Units 3 and 4	AP1000	Southern Nuclear Operating Company (SNC)	Issued
William States Lee III, Units 1 and 2	AP1000	Duke Energy	Issued

Page Last Reviewed/Updated Wednesday, April 25, 2018

**BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA**

DOCKET NO. 2018-319-E

In the Matter of:)	
)	
Application of Duke Energy Carolinas, LLC)	DIRECT TESTIMONY OF
For Adjustments in Electric Rate Schedules and)	CHRISTOPHER M. FALLON
Tariffs)	FOR DUKE ENERGY
)	CAROLINAS, LLC

I. INTRODUCTION

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Christopher M. Fallon and my business address is 550 South
3 Caldwell Street, Charlotte, North Carolina 28202.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed by Duke Energy as Vice President of Duke Energy Renewables
6 and Commercial Portfolio. I assumed this position on November 1, 2016. Prior
7 to assuming my current position, I was Vice President of Nuclear Development
8 from January 1, 2012 through October 2016.

9 **Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL**
10 **QUALIFICATIONS.**

11 A. I hold a Bachelor of Science Degree and a Master of Science Degree in
12 Electrical Engineering from Clemson University. I am a licensed professional
13 engineer in North Carolina.

14 **Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION?**

15 A. Yes. I have participated in allowable ex-parte briefings on the IRP and
16 GridSouth.

17 **Q. PLEASE DESCRIBE YOUR DUTIES AS VICE PRESIDENT OF**
18 **NUCLEAR DEVELOPMENT.**

19 A. I was responsible for Duke Energy's overall new nuclear generation strategy,
20 with a strong focus on the pursuit of combined licenses ("COLs") from the
21 Nuclear Regulatory Commission ("NRC"), initially for the William States Lee
22 Nuclear Station Units 1 & 2 in Cherokee County, South Carolina (the "Lee

1 Nuclear Project” or the “Project”). After the merger with Progress Energy, I
2 assumed responsibility for the development of the Shearon Harris Nuclear Plant
3 Units 2 & 3 in New Hill, North Carolina, and the Levy Nuclear Plant Units 1 &
4 2 in Levy County, Florida.

5 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

6 A. My testimony provides background on the Lee Nuclear Project development
7 activities and preconstruction costs submitted in this case for cost recovery.

8 **Q. DOES YOUR TESTIMONY INCLUDE ANY EXHIBITS?**

9 A. Yes. Attached as Exhibit 1 to my testimony is the “Final Report to the Public
10 Staff of the North Carolina Utilities Commission Independent Investigation of
11 the Prudence & Reasonableness of the Costs Incurred by Duke Energy
12 Carolinas, LLC to Develop the W.S. Lee III Nuclear Plant (“Project”) and its
13 Request to Cancel the Project dated January 22, 2018” prepared and submitted
14 by Global Energy & Water Consulting, LLC (“Global Energy”). Global Energy
15 was retained by the North Carolina Utilities Commission (“NCUC”) Public
16 Staff to review the Lee Nuclear Project development costs in connection with
17 pending rate proceedings in North Carolina in NCUC Docket No. E-7, Sub
18 1146. Global Energy found that Duke Energy Carolinas, LLC’s (“DE
19 Carolinas” or the “Company”) decisions regarding the Lee Nuclear Project
20 costs were appropriate at the time they were made and that the expenditures to
21 obtain the COLs were reasonable and prudent.

1 **Q. WHAT PRECONSTRUCTION COSTS RELATED TO THE LEE**
2 **NUCLEAR PROJECT DEVELOPMENT IS THE COMPANY SEEKING**
3 **TO RECOVER IN THIS CASE?**

4 A. DE Carolinas incurred actual preconstruction costs for the development of the
5 Lee Nuclear Project totaling approximately \$558 million through June 30,
6 2018.¹ The costs are specifically made up of Combined License Application
7 (“COLA”) Preparation, NRC Review and Hearing Fees, Pre-Construction and
8 Site Preparation, Land and Right of Way Purchases, Supply Chain,
9 Construction Planning and Engineering, Operational Planning, Post COL,
10 Allocated, and Allowance for Funds Used During Construction (“AFUDC”)
11 through December 31, 2017. The specific details of the costs have been
12 routinely reported to the Public Service Commission of South Carolina (the
13 “PSCSC” or “Commission”) as part of the Company’s reporting requirements
14 per the Commission orders approving the Company’s decision to incur Lee
15 Nuclear Project preconstruction costs. The Company is requesting Commission
16 approval to recover the South Carolina retail allocable share of the Lee Nuclear
17 Project preconstruction costs.

18 These actual costs, along with estimated additional expenditures through May
19 31, 2019, form the basis for the pro forma that serves as the support for the
20 Company’s rate requests in this case as presented by DE Carolinas Witness Kim
21 Smith. The total balance for which the Company is requesting recovery from
22 South Carolina retail customers is approximately \$125 million.

¹ All costs stated at system total unless otherwise noted.

1 **Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?**

2 A. The remainder of my testimony is organized as follows:

3 II. LEE NUCLEAR PROJECT LICENSING BACKGROUND

4 III. PRIOR COMMISSION DECISIONS REGARDING LEE
5 NUCLEAR PROJECT DEVELOPMENT COSTS

6 IV. DECISION TO ABANDON THE LEE NUCLEAR PROJECT

7 V. COST RECOVERY

8 VI. CONCLUSION

II. LEE NUCLEAR PROJECT LICENSING BACKGROUND

9 **Q. PLEASE BRIEFLY DESCRIBE THE LICENSING PROCESS**
10 **UNDERTAKEN TO PURSUE NUCLEAR DEVELOPMENT.**

11 A. DE Carolinas has continually included nuclear energy, a proven carbon-free
12 base load technology, as a viable resource in ensuring fuel diversity and
13 reliability for South Carolina customers in its integrated resource planning
14 (“IRP”) process. In the middle of the last decade, DE Carolinas along with
15 many utilities across the country, began the process to license new nuclear
16 generation. This effort by DE Carolinas was spurred by what was at the time
17 an environment of high natural gas prices, extreme volatility in natural gas
18 prices, the expected impacts of the 2005 Clean Air Interstate Rule and other
19 possible carbon limiting environmental regulations as well as the positive
20 support for nuclear generation afforded by the Energy Policy Act of 2005
21 (“EPAAct”).

1 To build and operate a new nuclear reactor, DE Carolinas is required to
2 obtain a license under either the new process in 10 CFR Part 52 (“Part 52”) or
3 obtain a construction permit and operating license under the previously existing
4 10 CFR Part 50 (“Part 50”) process. Under the new Part 52 process, which DE
5 Carolinas selected to obtain the Lee Nuclear Project COL, the NRC issues a
6 combined operating and construction license, which the NRC describes as a
7 combined license, to applicants. The COL provides a licensee the ability to
8 construct, and upon meeting certain criteria, operate a new nuclear reactor. In
9 addition, the NRC also certifies new nuclear reactor designs, which is
10 particularly important because these certified designs can be referenced by the
11 applicant seeking approval to construct and operate the new reactor rather than
12 having to demonstrate the safety of the designs on its own. The Westinghouse
13 AP1000 Pressurized Water Reactor (“AP1000”) design was the first new
14 passive reactor design for which the NRC issued a final design certification.

15 Although intended to be an improvement over the prior Part 50 licensing
16 process, the new Part 52 licensing process still has a significant lead time when
17 compared to permitting other generation resources such as combined cycle
18 natural gas generation. The long lead time needed for licensing and constructing
19 new nuclear units led DE Carolinas to proactively act to ensure that nuclear
20 generation was available to customers when needed, based on the base load
21 need identified in its IRP.

1 **Q. DID DE CAROLINAS SUBMIT A COMBINED LICENSE**
2 **APPLICATION WITH THE NRC?**

3 A. Yes. DE Carolinas submitted a COLA with the NRC for two AP1000 reactors
4 on December 13, 2007.

5 **Q. HAS THE NRC ISSUED A COL FOR THE LEE NUCLEAR PROJECT?**

6 A. Yes. On December 19, 2016, the NRC issued COLs for the Lee Nuclear Project
7 under Part 52 that allows the utility to construct the units at the Lee Nuclear
8 Project site and operate the units for 40 years following an NRC finding under
9 10 CFR 52.103(g) that the acceptance criteria in the COL are met.

10 **Q. IS DE CAROLINAS REQUIRED TO IMMEDIATELY BUILD THE**
11 **NEW NUCLEAR PLANT IN ORDER TO MAINTAIN THE LEE COL?**

12 A. No. A COL grants permission but does not compel the licensee to build and
13 operate the plant. Nor is there a requirement that DE Carolinas start
14 construction within a specified period of time. The Part 52 license provides the
15 flexibility to start construction at the appropriate time. Once the NRC issues
16 the license, they have made a determination that the reactor design on the
17 selected site provides adequate protection of public health and safety, the
18 environment, and the common defense and security. From time to time, as new
19 information is learned that might affect the safety determination by the NRC,
20 the license may need to be updated to confirm that the design provides
21 protection given the new information. As AP1000 units have proceeded with
22 construction in China and the U.S., numerous design changes to the AP1000
23 design have been required. Changes that were deferred for post-COL inclusion

1 into the Lee Nuclear Project licensing basis will need to be incorporated into
2 the Lee Nuclear Project COL for the plant to be constructed. In addition,
3 submittal of an annual Final Safety Analysis Report (“FSAR”) update and
4 recurring regulatory reporting are important to maintaining the COL. The
5 license expires 40 years after construction of the new units is completed and the
6 NRC has issued its 52.103(g) findings, as stated previously.

7 **Q. WHAT IS THE CURRENT STATE OF THE LEE NUCLEAR PROJECT?**

8 A. As discussed above, the Lee Nuclear Project has been granted a COL. The COL
9 does not expire and has value for DE Carolinas customers because it eliminates
10 the long-lead time required for nuclear construction projects and preserves the
11 nuclear option for DE Carolinas customers. Thus, the Lee site will continue to
12 be an option for the Company’s customers as part of the Company’s long-term
13 generation planning efforts. However, at this time, the Company has
14 determined that it is no longer feasible to develop the Project as originally
15 envisioned and has abandoned the project and is only investing those costs
16 necessary to maintain the COL and site at a minimum level. The Company will
17 continue to evaluate both the need for power and the timing for future nuclear
18 and update this Commission through its annual IRP filing.

III. PRIOR COMMISSION DECISIONS REGARDING LEE NUCLEAR
PROJECT DEVELOPMENT COSTS

1 **Q. WHEN DID THE COMPANY DETERMINE THE NEED TO BEGIN**
2 **PLANNING FOR NEW NUCLEAR?**

3 A. Through its Annual Plan process, beginning in 2005, DE Carolinas identified
4 the need for significant capacity additions by summer 2016 and identified
5 nuclear generation as a least cost supply-side alternative to meet part of that
6 need. At the time, there had been renewed interest in new nuclear generation
7 in the United States. This renewed interest was attributable to several factors,
8 including (a) a need for new base load generation capacity over the next decade
9 in many areas of the country; (b) recognition, both internationally and
10 domestically, in the environmental benefits of nuclear generation as the focus
11 on carbon emissions heightened, particularly as climate change regulation
12 received greater consideration; (c) the need for American business and industry,
13 for whom the price of electricity can be a significant component of overall
14 operating costs, to remain competitive in global markets as other countries
15 maintained or even increased their reliance on nuclear generation; (d) rising and
16 often volatile prices associated with the fuels used in fossil generation assets,
17 particularly natural gas but also coal; and (e) increasing concerns about our
18 nation's energy security and energy independence. Because of these factors,
19 the EPAct contained various provisions that encouraged the development of
20 new nuclear generation. At the same time that these exogenous economic
21 factors began to prevail, nuclear generation technology, design, and safety had

1 improved markedly. The NRC had also made changes to the licensing process
2 (the Part 52 process described above) for new nuclear plants that were
3 anticipated to remove uncertainty and to enhance the efficiency of the licensing
4 process.

5 Around that same time, in 2006, the South Carolina General Assembly
6 expressed its support of new nuclear generation in its June 1, 2006, Joint
7 Resolution of the General Assembly of South Carolina, “A Concurrent
8 Resolution to Advance the Need for Electric Utilities to Build New Nuclear
9 Power Plants in South Carolina and to Urge the Office of Regulatory Staff
10 (“ORS”) and the Public Service Commission to Encourage Such
11 Consideration.” H. 5326.

12 **Q. FOLLOWING THE JOINT RESOLUTION, DID THE SOUTH**
13 **CAROLINA GENERAL ASSEMBLY PASS LEGISLATION**
14 **REGARDING NEW NUCLEAR CONSTRUCTION AND ADVANCE**
15 **COMMISSION APPROVAL OF A UTILITY’S REQUEST TO INCUR**
16 **PRE-CONSTRUCTION COSTS?**

17 A. Yes. S.C. Code Ann. § 58-33-225, effective May 1, 2007, was enacted as part
18 of the Base Load Review Act (“BLRA”) and provided that at any time prior to
19 filing an application or a combined application under the BLRA, a utility may
20 file a request with the Commission and ORS to review the utility’s decision to
21 incur preconstruction costs for a potential nuclear-powered facility.² The

² Similar legislation was also passed in 2007 in North Carolina expressly providing for commission approval of a utility’s decision to incur nuclear project development costs. See N.C. Gen. Stat. §62-110.7.

1 statute further provided that prudent preconstruction costs must be properly
2 included in the utility's plant-in-service and must be fully recoverable in rates
3 in future proceedings under the BLRA unless the record shows that individual
4 items of cost were imprudently incurred or other decisions subsequent to the
5 issuance of a project development order were imprudently made considering
6 the information available to the utility at the time. In addition, the statute
7 provided that if the utility abandons the project after issuance of a prudency
8 determination, the utility may defer the preconstruction costs and calculate
9 AFUDC on the balance to be recovered in rates in the next general rate
10 proceeding or revised rates proceeding, provided that the utility proves by a
11 preponderance of the evidence, that its decision to abandon the project was
12 prudent. Thus, S.C. Code Ann. § 58-33-225 provided utilities with assurance
13 that the significant costs spent pursuant to a nuclear project development order
14 would be recoverable unless the Commission determines the costs were
15 imprudently incurred. Thus, the BLRA and the North Carolina General Statute
16 § 62-110.7 provided important assurances upon which DE Carolinas relied on
17 in moving forward with its decision to pursue the Lee Nuclear Project COL.

18 **Q. PRIOR TO THE COMPANY'S REQUEST TO CANCEL THE LEE**
19 **NUCLEAR PROJECT IN 2017 DID DE CAROLINAS' ANNUAL PLANS**
20 **SUPPORT THE DEVELOPMENT OF THE LEE NUCLEAR PROJECT?**

21 A. Yes. In each Annual Plan filed with the Commission between 2006 and 2016
22 the Lee Nuclear Project continued to be identified as a cost-effective option to
23 meet base load energy needs for customers. It is important to note that over that

1 period, the date upon which the Lee Nuclear Project was projected to be needed
2 by customers has changed due to a variety of factors that have been thoroughly
3 reviewed through the integrated resource planning process. The earliest need
4 dates forecasted for the two Lee Nuclear Project units in the 2016 Annual Plan
5 were 2024 and 2026.

6 **Q. DID THE COMPANY MAKE ANY FILINGS WITH THIS**
7 **COMMISSION PURSUANT TO S.C. CODE ANN. § 58-33-225**
8 **REGARDING DEVELOPMENT OF THE LEE NUCLEAR PROJECT?**

9 A. Yes. On December 7, 2007, in Docket No. 2007-440-E, pursuant to S.C. Code
10 Ann. § 58-33-225, DE Carolinas filed an Application for Approval of Decision
11 to Incur Nuclear Generation Pre-Construction Costs (the “2007 Application”).
12 In the 2007 Application, DE Carolinas requested approval of its decision to
13 incur the South Carolina allocable share³ of preconstruction costs of up to \$230
14 million through December 31, 2009 for the Lee Nuclear Project to ensure the
15 project remained an option to serve customers in the 2018 timeframe. At the
16 time, DE Carolinas anticipated incurring preconstruction costs of
17 approximately \$70 million through December 31, 2007 and \$160 million from
18 the time period January 1, 2008 to December 31, 2009.

³ The South Carolina allocable share is 24.0911%.

1 **Q. WHAT WAS THE BASIS FOR DE CAROLINAS ESTIMATE OF**
2 **PRECONSTRUCTION COST FOR THE LEE NUCLEAR PROJECT?**

3 A. The estimate was based on the best information available to the Company at the
4 time and DE Carolinas stated that as information was refined during the
5 development process, the estimate could be substantially impacted, and it would
6 update the Commission accordingly. DE Carolinas explained that no final
7 decision had been made to construct the facility and it would retain significant
8 flexibility to adjust the development and construction plans in light of
9 additional information to be gained in future years.

10 **Q. DID THE COMMISSION APPROVE THE COMPANY’S REQUEST?**

11 A. Yes, the Commission issued an order approving the Company’s request on June
12 9, 2008, finding DE Carolinas decision to incur the South Carolina-allocable
13 portion of Lee Nuclear Project pre-construction costs reasonable and prudent.
14 In the 2008 order, the Commission stated that its approval did not constitute
15 approval of the reasonableness and prudence of specific project development
16 activities or recoverability of specific items of cost.

17 **Q. DID DE CAROLINAS FILE ANY SUBSEQUENT PROJECT**
18 **DEVELOPMENT APPLICATIONS?**

19 A. Yes. On January 7, 2011 in Docket No. 2011-20-E, pursuant to S.C. Code Ann.
20 § 58-33-225, DE Carolinas filed an Amended Project Development Application
21 for Approval of Decision to Incur Nuclear Generation Pre-Construction Costs
22 (the “2011 Application”).⁴

⁴ The Company sought similar authority from the North Carolina Utilities Commission regarding the North Carolina allocable portion of Lee Nuclear Project development costs.

1 **Q. WHAT DID THE COMPANY REQUEST IN THE 2011 APPLICATION?**

2 A. In the 2011 Application, the Company requested authority to incur additional
3 pre-construction costs of \$229 million through December 31, 2013, for a total
4 of \$459 million (including Allowance for Funds Used During Construction
5 ("AFUDC")) to ensure the Lee Nuclear Project remained on schedule to serve
6 customer needs in the 2021 timeframe. DE Carolinas noted that the
7 environment for planning the Company's system continued to be dynamic and
8 it was reasonable and prudent for the Company to continue developing the Lee
9 Nuclear Project.

10 **Q. DURING THE 2011 PROCEEDING HAD THE COMPANY MADE A**
11 **FINAL DETERMINATION TO CONSTRUCT THE LEE NUCLEAR**
12 **PROJECT?**

13 A. No. Although the Company continued to believe that the Lee Nuclear Project
14 was critical to meet future resource needs, the Company did not make a
15 commitment to build the facility. The Company made clear that to move
16 forward with building the Project, provisions similar to those contained in the
17 BLRA that allow for the recovery of financing costs outside of a rate case would
18 need to be in place in North Carolina. In addition, the COL would need to be
19 in place, and all necessary approvals from state regulators would need to be
20 obtained.

21 In both the 2007 and 2011 applications, the Company stressed that the
22 Lee Nuclear Project would have been the largest single capital project in the
23 history of the Company and the assurance sought by its application was critical

1 to the Company's financial well-being and the ability of DE Carolinas'
2 customers to count on a more diverse, greenhouse gas emission-free, generation
3 source.

4 **Q. WHAT WAS THE OUTCOME OF THE 2011 PROCEEDING?**

5 A. During the 2011 proceeding, DE Carolinas reached a Settlement Agreement
6 with the ORS and other intervenors that provided a constructive approach that
7 would allow DE Carolinas to keep the nuclear option available and maintain
8 the current schedule for obtaining a COL from the NRC, which at the time, was
9 anticipated to be received in 2013. The Settlement Agreement provided pre-
10 authorization that the Company could incur costs of up to \$75 million without
11 AFUDC, not to exceed \$120 million including AFUDC, during the time period
12 of January 1, 2011 through June 30, 2012. Moreover, the Settlement Agreement
13 provided that it was prudent for the Company to continue to incur development
14 costs for the Lee Nuclear Project only to the extent necessary to maintain the
15 current schedule for obtaining a COL to support a commercial operation date
16 for the Project in the 2021-2023 time frame. The parties agreed that the
17 Company must incur only the absolute minimum amount of dollars necessary
18 to keep the nuclear option available and that in any proceeding to recover such
19 costs, the Company must show that the activities it undertook met these
20 requirements.

21 The Company also agreed to provide (a) a monthly report on the status
22 of legislation to allow for recovery of financing costs outside a rate case in
23 North Carolina, (b) a quarterly report on expenditures and AFUDC; and (c) a

1 monthly report on the progress of the Company's negotiations to acquire an
2 interest in the V.C. Summer Units 2 and 3. The Settlement Agreement also
3 provided that DE Carolinas agreed that any change in ownership interest, output
4 allocation, sharing of costs or control, and any future option agreements
5 concerning the proposed Lee Nuclear Project would be subject to prior approval
6 of the Commission. The Commission approved the Settlement Agreement in
7 its entirety and issued an order on July 1, 2011.

8 **Q. ARE RECOVERABLE COSTS GREATER THAN THE AMOUNT**
9 **PREAUTHORIZED BY THE COMMISSION IN THE 2011**
10 **PROCEEDING?**

11 **A.** Yes. In order to keep the Lee Nuclear Project as an option within the targeted
12 timeframe the Company exceeded the preauthorized spending level and
13 incurred cost after June 30, 2012. At the time that the 2011 Application was
14 approved, DE Carolinas had projected receipt of the COL in 2013 for the Lee
15 Nuclear Project. As I explain later in my testimony, the capital spending activity
16 after 2013 declined substantially as project development activities continued to
17 be significantly limited to only the minimal amount necessary to keep the
18 nuclear option available. As Dr. Diaz will explain in his testimony, several
19 factors, many of which were outside the control of DE Carolinas, led to a longer
20 licensing period than originally projected.

1 **Q. PLEASE DISCUSS THE FACTORS THAT SUPPORTED**
2 **CONTINUATION OF PROJECT DEVELOPMENT ACTIVITIES AND**
3 **OBTAINING THE COL.**

4 A. First, the Project was still shown to be needed by customers. As demonstrated
5 through the IRP process, the Lee Nuclear Project continued to be an economic
6 choice for customers. Over the life of the Lee Nuclear Project, the timeframe
7 for when new nuclear would be needed has necessarily been amended as
8 assumptions in the IRP have been revised. However, up through the 2016 IRP,
9 the Lee Nuclear Project continued to demonstrate its viability as a least-cost
10 carbon free generation option for customers. In addition, one important benefit
11 of DE Carolinas' actions is that having the COL for the Lee Nuclear Project will
12 reduce the lead time required to license new nuclear while at the same time not
13 committing to billions of dollars of project expenditures. By obtaining the
14 license, DE Carolinas has mitigated one of the primary challenges to new
15 nuclear construction in the U.S., which is the time and effort needed to obtain a
16 COL to build and operate a nuclear plant. Having the COL for the Lee Nuclear
17 Project has shortened the total time needed to permit and construct a new
18 nuclear facility, which will benefit customers if nuclear is ever selected in the
19 future to meet customer needs.

20 Secondly, the resources and effort expended at the point the
21 preauthorization amount was reached made it reasonable and prudent for DE
22 Carolinas to continue its efforts to obtain the COL for the Lee Nuclear Project.
23 At the point at which the preauthorized spending level was reached, DE

1 Carolinas had spent significant time and resources to develop the COLA and
2 responded to over 595 requests for additional information from the NRC. The
3 Company was also closely working with the NRC to resolve the remaining
4 outstanding licensing issues and had invested significant time and resources
5 towards that end. The investment of those resources would have been lost had
6 the Project been suspended. In addition, DE Carolinas would have forfeited its
7 priority position in the NRC COLA review process and the NRC's limited
8 resources would have been redirected to other projects. Furthermore, we
9 continued to keep the Commission abreast of the schedule receipt of the COL
10 through the IRP process. Indeed, the schedule for receipt of the COL in 2016
11 is very close to the schedule expectation the Company reported to the
12 Commission in its 2013 IRP. Dr. Diaz will discuss in more detail factors that
13 played into the timing of receipt of the COL. In addition, the bulk of the capital
14 spent towards project development activities declined significantly after 2013
15 as the Company continued to limit spending to those activities that were
16 necessary to obtain the COL and preserve the Lee Nuclear Project as a
17 generation option in the timeframe established in the IRP.

18 **Q. ARE THERE ANY OTHER IMPORTANT FACTORS THAT**
19 **SUPPORTED CONTINUING WITH PROJECT DEVELOPMENT**
20 **ACTIVITIES?**

21 A. Yes. The Company's decision to proceed with Project Development activities
22 was also bolstered by the robust environment for licensing that continued in the
23 United States. After the Commission issued its preauthorization order in 2011,

1 the NRC issued its final rule on the Design Certification Amendment for the
2 AP1000. Later, in 2012, the NRC granted the Alvin W. Vogtle Electric
3 Generation Plant Units 3 and 4 (“Vogtle”) Project, which had become the
4 reference COL project, its license. Moreover, at the time the preauthorized
5 spending level was exceeded and even continuing today, other utilities were
6 pursuing COLs and competing for very limited NRC COLA review resources.
7 Both South Texas Project Units 3 and 4 and Levy Nuclear Plant Units 1 and 2
8 were issued COLs in 2016 prior to the receipt of the Lee Nuclear Project COL.
9 And since the Lee Nuclear Project COL was issued, Dominion Virginia Power
10 received a COL for North Anna Unit 3 and Florida Power and Light received
11 COLs for Turkey Point Units 6 and 7. To suspend the pursuit of the COL with
12 the NRC because the preauthorization amount had been reached would have
13 eliminated the benefit of DE Carolinas’ efforts to decrease the long lead time
14 for new nuclear plant construction when the Company had already completed a
15 significant portion of the requirements necessary to obtain a COL.

IV. DECISION TO ABANDON THE LEE NUCLEAR PROJECT

16 **Q. WHAT IS THE CURRENT STATUS OF THE LEE NUCLEAR**
17 **PROJECT?**

18 **A.** Since the COL was issued in 2016, risks and uncertainties to initiating
19 construction on the Lee Nuclear Project have become too great and
20 abandonment of the Project as was originally envisioned is the best option for
21 customers. Significant events outside of DE Carolinas’ control have occurred

1 since the issuance of the COL for the Lee Nuclear Project that have made
2 abandonment the appropriate choice at this time.

3 In early 2017, Westinghouse announced that it had suffered significant
4 losses from its AP1000 projects in the U.S. and planned to exit the nuclear plant
5 construction business. On February 14, 2017, Toshiba, the parent company of
6 Westinghouse, announced that it would be taking a \$6.3 billion write down of
7 its Westinghouse nuclear business. Toshiba's total market capitalization at that
8 time was approximately \$8 billion. At the same time, Toshiba announced the
9 resignations of Toshiba's CEO and Westinghouse's Chairman and CEO, and
10 indicated Toshiba's desire to sell all or a part of Westinghouse. On March 29,
11 2017, Westinghouse declared Chapter 11 bankruptcy. Furthermore, additional
12 costs in the billions of dollars and delays were announced for the two AP1000
13 plants in Georgia and South Carolina.

14 Because of the bankruptcy, Westinghouse was unable to proceed with
15 the Engineering, Procurement and Construction contracts it entered to complete
16 the U.S. AP1000 projects, Vogtle Units 3 and 4 in Georgia and the Virgil C.
17 Summer Nuclear Station Units 2 and 3 ("V.C. Summer") in South Carolina.
18 The Vogtle Owners have entered into a Services Agreement with Westinghouse
19 whereby Westinghouse will provide some procurement and engineering support
20 as well as access to the AP1000 intellectual property. The Vogtle Owners
21 entered into a separate construction agreement with Bechtel, a separate
22 contractor, to provide construction services for the Vogtle project. On July 31,

1 2017, the V.C. Summer owners announced their decision to cease construction
2 of the V.C. Summer project.

3 **Q. WHAT IMPACT DID THE WESTINGHOUSE BANKRUPTCY HAVE**
4 **ON THE LEE NUCLEAR PROJECT?**

5 A. The AP1000 technology, which is the design utilized for the Lee Nuclear
6 Project, is owned by Westinghouse. For the development of the U.S. projects,
7 Westinghouse had contracted with other firms to form a consortium to share the
8 financial risk of new nuclear plant construction. The consortium entered into
9 Engineering, Procurement and Construction (“EPC”) Agreements with the
10 owners of the Vogtle and the V.C. Summer projects to construct the plants and
11 turn over operation of the plants to the utility owners upon construction
12 completion. The expectations of a similar EPC contracting structure formed
13 the basis for the pricing, schedule, and risk allocation for the Company’s
14 proposed Lee Nuclear Station included in the Company’s IRP. Over time, the
15 consortium membership changed and eventually Westinghouse acquired the
16 interest of its other unaffiliated consortium partner such that it no longer shared
17 the financial risk with an unaffiliated consortium partner. However,
18 Westinghouse was unable to ultimately bear the financial risk of the losses it
19 sustained on the V.C. Summer and Vogtle projects causing it to file for
20 bankruptcy protection.

21 Westinghouse’s exit from the construction business and bankruptcy in
22 2017 and the subsequent decision to cease construction of the V.C. Summer
23 Project raises significant uncertainty around the cost, schedule, and execution

1 of construction for future AP1000 nuclear projects. These uncertainties had a
2 direct impact on the ability to initiate construction of the Lee Nuclear Project
3 and contributed to the Company's decision to abandon it.

4 **Q. HAS DE CAROLINAS ABANDONED THE LEE NUCLEAR PROJECT?**

5 A. Yes. On August 25, 2017, the Company filed a letter with the Commission in
6 PSCSC Docket No. 2011-20-E notifying the Commission that it was requesting
7 approval from the NCUC to cancel the Lee Nuclear Project pursuant to N.C.
8 Gen. Stat. § 62-110.7, as a predicate to cost recovery for the project in North
9 Carolina. Shortly thereafter, on September 1, 2017, the Company filed its 2017
10 Annual Plan with this Commission in Docket 2017-10-E explaining that revised
11 projections indicated that new nuclear baseload capacity was needed only under
12 a carbon-constrained scenario with the assumption of no existing nuclear re-
13 licensing. Even in that scenario, the added capacity would not be needed until
14 much later (in the 2031 and 2033 timeframe) than projected in the 2016 IRP.
15 Thus, the Company explained its decision to abandon the Lee Nuclear Project
16 was based on: (1) the very limited circumstances under which the nuclear
17 capacity would ever be needed; (2) the later need dates if those limited
18 circumstances came to pass; (3) the risks resulting from the Westinghouse
19 bankruptcy and decision to exit the nuclear construction business; (4) the
20 substantial cost increases and schedule delays associated with the Vogtle and
21 V.C. Summer projects, and the subsequent V.C. Summer project abandonment.

1 In its Order Accepting Stipulation, Deciding Contested Issues, and
2 Requiring Revenue Reduction, in Docket Nos. E-7 Sub 819 and E-7, Sub 1146
3 dated June 22, 2018 (the “NC DE Carolinas Rate Case Order”), the NCUC
4 approved the Company’s request to cancel the Lee Nuclear Project and
5 permitted recovery of the North Carolina allocable share of the Company’s
6 investment in the Lee Nuclear Project with some limited exceptions. In light of
7 its decision to abandon the Lee Nuclear Project, the Company is seeking
8 recovery of the Lee Nuclear Project abandonment costs from this Commission
9 for the South Carolina allocable share of the Company’s investment.

10 **Q. IS THE DECISION TO ABANDON THE LEE NUCLEAR PROJECT**
11 **PRUDENT?**

12 A. Yes. Given the costs and risks associated with constructing the Lee Nuclear
13 Project that materialized in 2017, DE Carolinas’ decision to abandon the project
14 is prudent. Although DE Carolinas received its COL from the NRC, events
15 shortly thereafter caused the Company to re-evaluate its plans and determine
16 that the Project, as originally envisioned, was no longer in the best interest of
17 customers. The uncertainty around future construction arrangements and cost
18 for an AP1000 unit as a result of the Westinghouse bankruptcy has created an
19 unknown cost to construct and higher level of risk to continue the Lee Nuclear
20 Project at this time. These critical factors, combined with projected low natural
21 gas prices for the foreseeable future, and uncertain near- and longer-term carbon
22 emissions costs, render it no longer beneficial to customers to construct and
23 commence operation of the Lee Nuclear Project before the end of the next

1 decade. Given these uncertainties facing the project, DE Carolinas believed it
2 was in its customers' best interests to abandon the project. The Company
3 remains committed to clean power and nuclear energy, and the COL and site
4 preparation work can be leveraged should the need for new nuclear arise in the
5 future. DE Carolinas will continue to monitor the Vogtle Project to evaluate
6 risk and project execution strategies

7 In many ways, DE Carolinas' methodical, deliberate and measured
8 approach to evaluate and pursue new nuclear has provided customers with both
9 the viable option of new nuclear by taking the steps necessary to maintain
10 nuclear as a future option, while also avoiding some of the challenges that have
11 been encountered by early adopting utilities who have already undertaken full
12 construction.

13 **Q. HAS DE CAROLINAS STOPPED PRECONSTRUCTION ACTIVITIES**
14 **ON THE LEE NUCLEAR PROJECT?**

15 A. Yes. No preconstruction work continues. Rather, the only costs that continue
16 to be incurred by DE Carolinas are those costs necessary to maintain the COL
17 and site in order to provide options for customers in the future.

V. COST RECOVERY

18 **Q. HAS THE BLRA BEEN AMENDED SINCE THE COMPANY**
19 **RECEIVED THE LEE NUCLEAR PROJECT DEVELOPMENT**
20 **ORDERS?**

21 A. Yes. Effective July 5, 2018, South Carolina House Bill 4375 amended the
22 BLRA so that the Commission "must not accept a base load review application,

1 nor may it consider any requests made pursuant to Article 4, Chapter 33, Title
2 58 other than in a docket currently pending before the Commission.”⁵ Further,
3 HB 4375 provides that “[t]he provisions of Article 4, Chapter 33, Title 58 are
4 repealed upon the conclusion of litigation concerning the abandonment of V.C.
5 Summer Units 2 and 3.”⁶

6 **Q. HOW DO THE 2018 BLRA AMENDMENTS IMPACT THE LEE**
7 **NUCLEAR PROJECT?**

8 A. While I am not a lawyer, I have been advised that because DE Carolinas does
9 not currently have any requests made pursuant to Article 4, Chapter 33, Title 58
10 pending before the Commission, it is unable to request recovery of the
11 abandoned Lee Nuclear Project preconstruction costs pursuant to S.C. Code
12 Ann. §58-33-225(G). Nevertheless, the Company continues to comply with the
13 requirements of the project development orders issued under the BLRA
14 provisions by filing update reports pursuant to the terms of the Settlement
15 Agreement.

16 **Q. PRIOR TO THE ENACTMENT OF THE BLRA IN 2008, HAD THE**
17 **COMMISSION PREVIOUSLY PERMITTED RECOVERY OF**
18 **ABANDONED PLANT?**

19 A. Yes, I have been advised that prior to the enactment of the BLRA, Commission
20 precedent allowed recovery of prudently incurred abandoned plant cost and that
21 this precedent is still applicable today as an independent basis for recovery

⁵ S.C. Code Ann. § 58-33-220 2.A. (2018).

⁶ S.C. Code Ann. § 58-33-220 2.B. (2018).

1 separate from the recovery provisions previously available to the Company
2 under the BLRA. The Company also appropriately relied upon the
3 Commission's orders in Docket Nos. 2007-440-E and 2011-20-E finding its
4 decision to incur preconstruction costs for the Lee Nuclear Project as prudent.
5 Thus, the Company respectfully requests that the Commission allow it to
6 recover the South Carolina allocable portion of its investment of the Lee
7 Nuclear Project as discussed further below.

8 **Q. WHAT COSTS RELATED TO THE LEE NUCLEAR PROJECT IS THE**
9 **COMPANY SEEKING TO RECOVER IN THIS CASE?**

10 A. The total estimated balance of cost at May 31, 2019 is approximately \$559
11 million for the development of the Lee Nuclear Project. The total estimated
12 balance of \$559 million includes AFUDC through December 31, 2017. The
13 Company is seeking Commission approval to recover the South Carolina retail
14 allocable share of approximately \$125 million of the total system spend,
15 adjusted for non-depreciable land moved to Land held for Future Use. These
16 costs are specifically made up of COLA Preparation, NRC Review and Hearing
17 Fees, Land and Right-of-Way Purchases, Pre-Construction and Site
18 Preparation, Supply Chain, Construction Planning and Detailed Engineering,
19 Operational Planning, Post COL, Allocated amounts and AFUDC. The specific
20 details of actual costs incurred through September 31, 2018 are included in the
21 table below:

Category of Cost	Dollars Expended through 09/30/18 on System-Wide Basis*
COLA Preparation	\$25 Million
NRC Review and Hearing Fees	\$110 Million
Land and Right-of-Way Purchases	\$44 Million
Pre-construction and Site Preparation	\$22 Million
Supply Chain, Construction Planning, and Detailed Engineering	\$80 Million
Operational Planning	\$5 Million
Post COL	\$2 Million
Allocate	\$22 Million
AFUDC	\$248 Million
Total	\$559 Million

*Details may not add to total due to rounding. The South Carolina allocable share is approximately 24 percent.

1 Company witness Kim H. Smith describes the rate treatment, including the
2 proposed amortization schedule, in her direct testimony filed in this case.

3 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE**
4 **COLA PREPARATION CATEGORY.**

5 A. This category includes costs related to DE Carolinas labor, expenses and
6 contract support for preparation of the COLA tendered to the NRC on
7 December 13, 2007. The NRC determined the application was suitable for
8 review and docketed the application on February 25, 2008.

1 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE NRC**
2 **REVIEW AND HEARING FEES CATEGORY.**

3 A. This category includes the cost of the NRC review fees, DE Carolinas labor and
4 expenses, contract labor and legal support required to support the NRC review
5 of the Lee Nuclear Station COLA, and preparation for the Advisory Committee
6 on Reactor Safeguards Subcommittee Hearing. This category also includes
7 interactions with South Carolina Department of Health and Environmental
8 Control and the U.S. Army Corps of Engineers (“USACE”), as required to
9 move the environmental permit applications forward. The Lee Nuclear Project
10 received the National Pollutant Discharge Elimination System Operations
11 permit on July 17, 2013. The Final Environmental Impact Statement was issued
12 by the NRC on December 23, 2013, and the 401 Water Quality Certification
13 was issued on January 2, 2014. The Final Environmental Impact Statement
14 prepared by the U.S. Forest Service to support mitigation activities in Sumter
15 National Forest was issued on December 5, 2014. The Lee Nuclear Station
16 received its USACE 404 Permit on September 29, 2015.

17 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE**
18 **LAND AND RIGHT-OF WAY PURCHASES CATEGORY.**

19 A. This category includes the purchase of land required for the Lee Nuclear Project
20 site and rail rights-of-way. This category also includes the cost of purchasing
21 additional land for a supplemental cooling pond in event of severe drought, as
22 well as costs for surveying the selected transmission right-of-way.

1 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE PRE-**
2 **CONSTRUCTION AND SITE PREPARATION CATEGORY.**

3 A. This category includes site activities to both maintain the site and prepare the
4 site for construction. Site preparation activities included: dewatering and
5 cleanup of the excavated area, site remediation activities required to identify
6 and properly dispose of hazardous wastes, and costs associated with the
7 demolition and removal of unusable structures. Necessary maintenance of
8 existing rail bed and required Make-up Pond B spillway repair were completed.
9 Engineering of offsite infrastructure for potable water, sewer, and rail spur, and
10 geotechnical evaluations (needed for engineering) have been completed.
11 Engineering for bringing communications to the site is also included in this
12 category. Engineering of necessary traffic improvements was brought to 85
13 percent completion by December 2013. Ongoing and continuing activities
14 include: site security, utilities and miscellaneous site maintenance.

15 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE**
16 **SUPPLY CHAIN, CONSTRUCTION PLANNING AND DETAILED**
17 **ENGINEERING CATEGORY.**

18 A. This category includes activities associated with working with the AP1000
19 consortium to negotiate an EPC agreement. Negotiations in 2008 did not result
20 in an executed contract because DE Carolinas was unable to come to terms on
21 a number of issues, most prominently cost and risk sharing. After the EPC
22 negotiations broke down, DE Carolinas decided to hold off on future EPC
23 discussions until after receipt of the COL when the project schedule could be

1 better defined. In preparation for future EPC negotiations and to better define
2 the project scope and reduce risk for customers, conceptual site-specific
3 engineering and construction planning activities necessary to develop a
4 complete project definition were continued and are included in this category.
5 Continuing construction planning activities serve to further develop
6 construction plans and keep the construction plans in line with the latest
7 engineering. Detailed site-specific engineering began in January 2011 and was
8 brought to 70 percent completion in December 2013. Commercial building
9 design activities started in June 2012, and design of the first six commercial
10 buildings was completed in December 2013. These activities were necessary
11 to preserve the on-line date based on the anticipated need identified for the Lee
12 Nuclear Project in the DE Carolinas IRP.

13 **Q. PLEASE DESCRIBE THE COSTS INCURRED AS PART OF THE**
14 **OPERATIONAL PLANNING CATEGORY.**

15 A. This category includes activities associated with emergency planning (“EP”),
16 operator and plant staff training, including costs associated with the Knowledge
17 and Abilities Catalog, required for operator license examinations for AP1000
18 plants, and the standardization of the nomenclature in the Westinghouse Master
19 Equipment List, supporting operations program development, such as Quality
20 Assurance Program, and the review of approximately 500 procedures. In 2011,
21 the NRC issued a final rule (76 FR 72560) amending certain EP requirements
22 in the regulations that govern domestic licensing of production and utilization
23 facilities (the “EP Final Rule”). The operational planning team was instrumental

1 in developing the DE Carolinas response to the EP Final Rule and these costs
2 are included in this category. The training materials, operational programs, and
3 operating procedures are all being developed in concert with other AP1000
4 utilities within the AP1000 Group LLC ("APOG LLC") framework. APOG
5 LLC was established for the purpose of providing technical, engineering and
6 procurement support services to the members and their licensing, development
7 and construction of AP1000 power plants. APOG LLC was the means to share
8 the cost of engineering and licensing activities between members to lower the
9 overall cost for each member. The Operational Planning category also includes
10 generation of administrative procedures that must be in place upon receipt of
11 COL from NRC.

12 **Q. PLEASE DESCRIBE THE POST COL CATEGORY.**

13 A. As previously discussed, the COL was received in December 2016. Design
14 finalization and first-of-a-kind construction issues at V. C. Summer and Vogtle
15 have required Westinghouse to make numerous changes to the AP1000 design.
16 Design changes continue to be issued as the lead plants advance toward
17 completion. Submittal of an annual FSAR update and recurring regulatory
18 reporting are required to maintain the COL.

19 **Q. PLEASE DESCRIBE THE ALLOCATE CATEGORY.**

20 A. This new category of cost relates to labor burdens and allocated labor costs. In
21 prior reporting this category had been manually spread to create cost status
22 reports. DE Carolinas determined that it is more accurate to show these charges
23 in a separate bucket and began reporting in this manner on November 21, 2017.

1 **Q. PLEASE DESCRIBE THE AFUDC CATEGORY.**

2 A. AFUDC costs are the financing costs (both debt and equity) on the capital
3 dollars incurred on the Project once the Project costs began being recorded to
4 FERC Account 107, Construction Work in Process.

5 **Q. WHAT COSTS HAS THE COMPANY INCURRED FOR THE LEE**
6 **NUCLEAR PROJECT?**

7 A. DE Carolinas has incurred a total of approximately \$558 million in cost for
8 project development activities through September 30, 2018. As discussed in
9 DE Carolinas Witness Kim H. Smith's testimony, DE Carolinas is requesting
10 Commission approval of the South Carolina allocable share of the Lee Nuclear
11 Project spend through September 30, 2018 including projected costs through
12 May 31, 2019, which total approximately \$518 million after non-depreciable
13 land is moved to Land held for Future Use.

14 **Q. WHAT COSTS DID THE COMPANY INCUR PURSUANT TO THE 2008**
15 **AND 2011 LEE NUCLEAR PROJECT DEVELOPMENT ORDERS?**

16 A. Of the total \$350 million authorized by the Commission through the 2008 and
17 2011 Lee Nuclear Project Development Orders, DE Carolinas incurred
18 approximately \$251 million during the authorized time periods in the orders.

19 **Q. PLEASE EXPLAIN ANY COSTS INCURRED OUTSIDE THE**
20 **TIMEFRAMES AUTHORIZED IN THE LEE NUCLEAR PROJECT**
21 **DEVELOPMENT ORDERS.**

22 A. In 2010, the Company incurred approximately \$36 million of Lee project
23 development costs. As previously explained, DE Carolinas requested approval

1 of its decision to incur these costs in its 2011 Application; however, the
2 Company reached a Settlement Agreement with ORS and some of the
3 intervenors, and the Commission approved the Company's decision to incur
4 costs, not to exceed \$120 million including AFUDC, during the time period of
5 January 1, 2011 through June 30, 2012. From July 1, 2012 to September 30,
6 2018, DE Carolinas incurred approximately \$271 marmillion in additional Lee
7 Nuclear Project development costs.

8 **Q. DID DE CAROLINAS TAKE STEPS TO LIMIT WORK PERFORMED**
9 **ON THE PROJECT TO THE MINIMAL AMOUNT NECESSARY TO**
10 **KEEP THE NUCLEAR OPTION AVAILABLE?**

11 A. Yes. As a result of the Commission's approval of the 2011 Application, DE
12 Carolinas began limiting its activities to only those activities and costs
13 necessary to obtain the COL and to keep the nuclear option available in the
14 targeted timeframe identified in the IRP. The Company did not order equipment
15 and wound down non-essential site-specific work, and construction planning
16 activities. The Company completed its contractual commitments in areas that
17 were no longer necessary and deliberately narrowed the scope of work to reduce
18 costs. Rather than immediately terminate contracts with contractors and incur
19 termination costs, the Company wound down contracts in an orderly manner
20 that preserved the work in a position to efficiently resume at a later date. The
21 Company's intent was to reduce costs to only those necessary, while preserving

1 the ability to resume work once the COL was received and the Company
2 decided to move forward with the project.

3 **Q. WERE ALL THE COSTS INCURRED FOR THE LEE NUCLEAR**
4 **PROJECT REASONABLE AND PRUDENTLY INCURRED PROJECT**
5 **DEVELOPMENT COSTS?**

6 A. Yes. As further discussed and explained also in the testimony of DE Carolinas
7 Witness Nils J. Diaz, the costs incurred to obtain a COL for the Lee Nuclear
8 Project were reasonably and prudently incurred project development costs
9 undertaken to ensure a diverse, cost effective and reliable supply of energy for
10 DE Carolinas' retail customers.

11 **Q. HAVE THERE BEEN ANY OTHER ANALYSES OR FINDINGS**
12 **REGARDING THE PRUDENCE OR REASONABLENESS OF THE**
13 **LEE NUCLEAR PROJECT DEVELOPMENT COSTS?**

14 A. Yes. The NCUC Public Staff reviewed the Lee Nuclear Project development
15 costs in connection with pending rate proceedings in North Carolina. There,
16 the Public Staff retained Global Energy to assist in the review of those costs and
17 I have included their final report to the Public Staff as Exhibit 1 to my testimony.
18 The Public Staff concluded that costs incurred by DE Carolinas in pursuit of the
19 COL, including costs associated with pre-construction and site development,
20 land and right-of-way purchases, supply chain, construction planning and
21 detailed engineering, operational planning, and post-COL costs were
22 reasonable and prudent with little exception.

23

VI. CONCLUSION

1 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

2 **A. Yes.**

Final Report
to the
Public Staff - North Carolina Utilities Commission
Independent Investigation of the Prudence & Reasonableness
of
Costs Incurred by Duke Energy Carolinas, LLC
to
Develop the W. S. Lee III Nuclear Plant (“Project”)
and its
Request to Cancel the Project
January 22, 2018

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SECTION 1.0: INTRODUCTION

Global Energy & Water Consulting, LLC (“Global or Consultant”), has been retained by the Public Staff - North Carolina Utilities Commission (“Public Staff”) to assist with a review of the prudence and reasonableness of approximately \$353M in costs (North Carolina retail jurisdictional costs only, including AFUDC) incurred by Duke Energy Carolinas, LLC (“DEC”), to develop the proposed W. S. Lee III Nuclear Plant (“WSL”), as well as DEC’s request to cancel the Project. DEC received from the Nuclear Regulatory Commission (“NRC”) a Combined Operating License on December 19, 2016. DEC filed a Request for Approval to Cancel the Project in Docket No. E-7, Sub 819, on August 25, 2017. DEC also filed a request to recover costs of the Project in a request for base rate increase in Docket No. E-7, Sub 1146, also filed on August 25, 2017. Subsequent to the filing to cancel the project and request to recover costs, the Public Staff entered into a contract with Global and our team of consultants to assist Public Staff with the prudence review.

The Global Team consists of Dr. William Jacobs, PE, Mr. George Evans, and Mr. Mark Crisp, PE. The members of the Global Team, both individually and as a team have been involved with reviews of Combined Operating License Applications (“COLA”), AP-1000 budgets and schedules, technology selection, integrated resource planning (“IRP”) filings, and construction progress, as well as contracting issues at V. C. Summer (SCANA), Vogtle (Southern Nuclear – Georgia Power), Turkey Point (Florida Power & Light), and Levy County (Progress Energy Florida), among other assignments in the nuclear industry. The focus of the Global assignment has been to review, investigate and assess the prudence and reasonableness of the approximately \$353M (North Carolina retail jurisdictional costs) in costs incurred by DEC during the application development process of the COL and filing with the NRC, costs associated with the Land and Right-of-Way Purchases for the site of the WSL plant, costs associated with Pre-Construction and Site Preparation, costs incurred for Supply Chain, Construction Planning, and Detailed Engineering, costs for Operational Planning, and investment financial costs included as Allowance for Funds Used During Construction (“AFUDC”) of \$155,440,000 (North Carolina retail jurisdictional cost) as of June 30, 2017, based on the DEC filing to the Commission. In addition, we have been charged with reviewing DEC’s Termination filing before the Commission.

In order for us to carry out the requirements of our engagement, Data Requests developed by our Team were propounded upon DEC to obtain the necessary information to provide a review of the

decision-making process DEC employed from the project conception up to the point of the filing of its Request for Approval to Cancel and its request for cost recovery before the Commission. In order for our Global Team to offer an opinion on the prudence and reasonableness of decisions and costs by DEC, we formed our position based on the preponderance of supportable documentation provided by DEC and the definition of prudence and reasonableness. The Public Staff provided us with the following language to guide our consideration of prudence:

...the standard for determining the prudence of the Company's actions should be whether management decisions were made in a reasonable manner and at an appropriate time on the basis of what was reasonably known or reasonably should have been known at that time. The Commission agrees that this is the appropriate standard to be used in judging the various claims of imprudence that have been put forth in this proceeding...and adopts it as the standard to be applied herein. The Commission notes that this standard is one of reasonableness that must be based on a contemporaneous view of the action or decision under question. Perfection is not required. Hindsight analysis -- the judging of events based on subsequent developments — is not permitted.

78 North Carolina Utilities Commission Report, 238 at 251-52 (1988)

This language is consistent with our experience in similar regulatory cases including other public utility commission's findings regarding prudence and the standard of proof necessary to support determinations of prudence. In our review, we looked at the following six (6) considerations:

- What data was available at the time of decision-making, as well as, management systems and procedures implemented to enable appropriate analysis.
- The effectiveness of the flow of information and whether data was communicated in a manner that facilitated sound decision-making.
- How the information was evaluated; whether the data was interpreted accurately; what alternatives were evaluated; and whether or not sound decisions or conclusions were drawn to meet the needs of the project, corporate entity, and the ratepayer.
- Whether or not decisions were made in a transparent manner with full participation.
- Whether or not these decisions were monitored and readdressed as necessary with changing conditions.
- Whether or not changes were communicated satisfactorily to all parties.

Of significant importance in our review was the first consideration, what data (information) was available ***at the time of decision-making*** (Emphasis added). A determination of prudence is not based on the final outcome of the work process. It is specifically confined to decisions made based on the data available or that should have been reasonably available to the utility at the time of the decision-making.

During the later years of the project, prior to the decision to terminate the project, DEC's IRPs provided updates on the Company's continued actions to obtain a COL and indicated that new nuclear generation was "a carbon-free, cost-effective, reliable option within the Company's resource portfolio." (See DEC 2014 and 2016 IRP) The Commission issued Orders approving DEC's IRPs. This is consistent with DEC's position that maintaining the COL had value and DEC should continue to engage with the NRC to formally maintain the "Status Quo" (NCUC Order dated August 5, 2011, Ordering Paragraph 1). The "Status Quo" for DEC was defined under that Order by the requirement that DEC "incur only those nuclear project development costs that must be incurred to maintain the status quo with respect to the Lee Station, including Duke's COL application at the NRC." The Order of the NCUC appears to indicate that the Commission found it appropriate for DEC to continue on its current trajectory of pursuing the COL from the NRC. As added direction for our team concerning the meaning of the term "status quo", we relied on our own experience in previous regulatory cases and the specific definition of "status quo" as published by both Merriam-Webster and Black's Law Dictionaries to be "*maintaining the existing state of affairs.*" Our professional experience supports this definition and further supports DEC's continued efforts to obtain a COL. In order to accomplish this task, not only was it necessary for DEC to continue its legal and administrative duties to work with the NRC to resolve all outstanding issues with its application but, just as importantly, DEC needed to continue to pursue permitting, pre-construction, engineering design, construction planning, and operational planning. Discontinuing effort in any one of these areas would have signaled to the NRC that DEC was not actively pursuing the COL, and could have resulted in termination of the COL review process by the NRC prior to its issuance of the COL. The existing COL possesses value and can be used to pursue the option to build a nuclear plant at the WSL site if conditions warrant in the future.

SECTION 2.0: EXECUTIVE SUMMARY

Global Energy & Water Consulting, LLC was awarded a contract on October 10, 2017, to support the Public Staff with its review of the prudence and reasonableness of approximately \$353M (North Carolina retail jurisdictional costs) incurred by DEC to develop the WSL Plant. Global immediately began its investigation by reviewing previously filed documents and testimony in Docket No. E-7, Subs 819 and 1146 and DEC's responses to data requests. The goal of our analysis was to provide the Public Staff with our professional analysis and opinion as to whether DEC's expenditures for the pre-construction of the WSL Plant were prudent and reasonable, along with our professional opinion concerning DEC's request to cancel the Project.

After careful consideration and thorough review of all public and confidential data made available to us, documents filed with the NCUC, filed testimony, review of data responses that covered the 2006 – 2016 time period, and our professional experience with other utilities in the Southeast concerning the development of the Westinghouse AP 1000 nuclear units, we have concluded that DEC's decisions were appropriate at the time they were made. We found the expenditures to obtain the COL to be reasonable and prudent within the limits of the definitions of reasonableness and prudence. We also found the costs incurred for pre-construction and site development, land and right-of-way purchases, supply chain, construction planning and detailed engineering, operational planning and post-COL to be reasonable and prudent, as well, subject to an issue raised by the Public Staff concerning the Visitors' Center. Additionally, the Public Staff is also examining issues involving AFUDC. It is worth reiterating at this point that all of DEC's decisions were reviewed on the basis of the knowledge that DEC had, or reasonably should have had, based on the contemporaneous information available, at the time of its decisions. A determination of prudence does not involve, nor should the determination be subjected to, a review of information that was not available to DEC at the time its decisions. Therefore, it is our opinion that all costs associated with the application for the COL and subsequent costs should be deemed prudent and reasonable, subject to the recommendation of the Public Staff on the costs of the Visitors' Center and issues involving AFUDC.

Our review of the project development costs for obtaining the WSL Plant COL concluded the dollars spent by DEC were similar in nature to project development costs we reviewed in SCANA's V. C. Summer Units 2 & 3 Baseload Review Act (South Carolina); in Southern Nuclear-Georgia Power's Alvin W. Vogtle Units 3 & 4; and in the COL Application of Florida Power & Light's Turkey Point Units 6 & 7.

While it is virtually impossible to perform a side-by-side comparison of costs by category, the total outlay of dollars can be reasonably compared. For example, DEC closed out the accrual of costs in the COLA Preparation category at the time the Application was accepted by the NRC. However, the cost category for “NRC Review and Hearing Fees” appropriately continued to capture costs. The NRC costs post-COL Application are nearly 100% associated with the NRC review of the application, efforts to respond to NRC requests for additional information (“RAI”), NRC review and approval of design changes, as well as modifications to the application due to external factors as determined by the NRC. Therefore, in DEC’s case, the cost to obtain the COL is almost entirely composed of dollars booked to the NRC Review and Hearing Fees account and to COL Preparation account.

Comparing the costs of the COL for DEC of \$275M+, including a pro rata share of AFUDC, with costs from SCANA, Southern Nuclear, and FP&L (\$286M, \$300M, & \$330M, respectively)¹ indicates DEC’s costs to be well within the realm of similar costs reported by other southeastern utilities, and in fact, tend towards the lower boundary of the composite cost. However, it would be inappropriate to attempt to make a direct comparison of such costs, as each of these utilities account for particular work tasks in somewhat different manners, according to their own internal accounting procedures, requirements of their specific state regulatory authorities, and certain requirements established by their regulatory authority with regards to AFUDC, return on equity (“ROE”), and the weighted average cost of long-term debt used to establish AFUDC. However, it is appropriate to compare the total cost of obtaining the COL across these utilities. Other external activities that also affect the “cost” of obtaining the COL include: the quality of the work performed by the individual utility or its contractor(s) and how this effort is accepted by the NRC. In the case of DEC, it appears that the quality of the application and the review by the NRC was performed without a significant volume of “rework” that would typically drive up the cost of the COL. It must be pointed out that during the time that DEC’s application was before the NRC, the NRC promulgated a significant volume of revisions and design changes to address safety related issues and “lessons learned” from the 2011 Fukushima accident.

In addition to the cost evaluation, we were tasked with the analysis of DEC’s decision to select nuclear generation as the next baseload resource to add to its generation fleet, and whether or not this decision was in the interest of the Ratepayer. The genesis of this decision dates back as early as 2004 in

¹ Actual line item costs used to develop a total cost to obtain a COL are not available as such level of cost detail is protected by Confidentiality Agreements that are within the regulatory purview of each utility and its State regulator.

DEC's annual IRP filings with the NCUC. These IRPs modeled current loads and future load forecasts, existing generation fleet operating criteria, existing and future cost of generation resources, fuel cost forecasts, and known and anticipated costs of environmental compliance. In short, we thoroughly reviewed and analyzed each of the confidential IRPs filed by DEC with the NCUC from 2005 through and including 2017, with particular focus on DEC's decision to pursue a COL with the NRC for the WSL Project. In addition, we evaluated DEC's responses to all discovery requests from the Public Staff related to these IRPs.

In summary we concluded that DEC's pursuit of the COL for the WSL Project was reasonable and prudent. Absent the COL, under circumstances known at the time, DEC would have been in an untenable and precarious situation regarding fuel diversity and the ability to reduce carbon dioxide ("CO₂") emissions. During this period of time, there was extensive pressure, both politically and publicly to reduce the CO₂ and nitrous oxide ("NO_x") constituents of fossil fuel emissions. The Obama Administration was proposing new heightened compliance regulations through the Clean Power Plan ("CPP"). There were also new state-level criteria for particulate matter, mercury, and other point source constituents. However, no formal, uniform "energy plan" was developed on which a utility could base its planning process. Therefore, it was necessary for DEC to make its best estimate as to the criteria that would govern decision-making during the planning horizon. As such, nuclear energy was a baseload generation source that fit the criteria for low particulate and gaseous emissions, while providing sustainable and reliable fuel diversity. At the time of its decision to plan for the addition of baseload generation resources to its generating fleet, nuclear generation was a reasonable option for planning purposes.

SECTION 3.0 EVALUATION OF COSTS BY TASK DESCRIPTION:

Throughout our analysis, the best method for us to audit costs was by maintaining the same categories DEC had developed to submit its analysis to the Commission for its semi-annual filing requirements established in ordering paragraph 4 of the Commission's August 5, 2011, *Order Approving Decision to Incur Limited Project Development Costs* in Docket No. E-7, Sub 819. The costs were tracked in the following eight (8) categories, and also shown in Table 1:

- COLA Preparation
- NRC Review & Hearing Fees
- Land and Right-of-Way Purchases
- Pre-construction and Site Preparation
- Supply Chain, Construction Planning, and Detailed Engineering
- Operational Planning
- Post COL
- AFUDC

Due to time and resource constraints, we elected to sample costs from a population that would support a statistical finding of 95% confidence, based on total dollars. We limited our review to the costs associated with tasks associated each of the eight (8) major cost categories listed above. Review of these costs can provide an additional level of confidence. If reasonableness and prudence is established for these cost groupings, we would then expect that an analysis of all cost groupings and cost categories to satisfy the same reasonableness and prudence. As an example, Enercon Consulting performed individual work tasks in each of the seven (7) non-AFUDC cost categories. They assisted with the COL Application. They also performed tasks supporting NRC Review and Hearings, Land and Right-of-Way Purchases, and Pre-construction, Supply Chain and Operational Planning. Since these costs supported the construction effort, AFUDC was accrued for these costs. Therefore, a thorough evaluation of these cost groupings provided a "statistical view" of the costs and decisions for all cost categories. In

addition to our specific cost analysis, we also performed a parallel review of costs and budgets to detailed information provided in various Data Requests. These documents include one hundred (100) integrated project reports authored by DEC, along with nearly 80 monthly status reports authored by Westinghouse/Shaw/Stone & Webster.

Section 3.1 – COLA PREPARATION -

COLA preparation “includes Duke labor, expenses and contract support for preparation of the Combined Construction and Operating License (COL) Application tendered to the Nuclear Regulatory Commission (NRC) on December 13, 2007. The NRC determined the application was suitable for review and docketed the application on February 25, 2008.”

The cost category for COLA Preparation included mainly costs incurred by DEC in the early years of the project (up through 2009), including its contractors. These costs were necessary to finalize the COLA and submit it to the NRC. DEC’s application for COL was docketed by the NRC in February of 2008; the final COL was issued by the NRC in December 2016. During the time period leading up to February 2008, DEC and its contractors were focused on completing the extensive requirements of the Code of Federal Regulations Title 10, Part 52 (10 CFR Part 52) and NUREG/BR-0298. DEC incurred costs of \$27.4M up to and through filing of the license application with the NRC.

Subsequent to the filing, DEC and its contractors also were required to attend NRC hearings, respond to NRC RAIs (over 950 per NRC Staff reports), and make modifications to the COL application. During the same period of time, the NRC Staff expended over 67,000 man-hours on DEC’s application. It is not unreasonable to expect that DEC a similar number of man-hours, if not more, developing the responses to the NRC RAIs and other requirements for design changes.

Our analysis of costs and billings provided in response to Data Request #14 shows that DEC clearly documented the costs of obtaining the COL. However, these were not the total costs for the COL, as once the filing had been successfully docketed with the NRC, DEC was required to respond to all questions raised by the NRC Staff and the Nuclear Safety Review Board (“NSRB”). The dollars in the NRC Review and Hearing cost category are included in order to capture all COL-related costs incurred through the issuance of the COL in 2016.

The NRC has captured the costs of the COL Application for seven licensee applications and made that information publicly available. Based on the NRC developed cost figures, the average cost of a COL,

based on those these seven sites, is \$29.9M. In the case of WSL Project, DEC spent \$27.4M for its application, well within the average of the seven sites.

The WSL Project began to accrue costs for the COL Application in August of 2006. These costs were primarily to cover in-house DEC Labor and expenses. There were also costs for outside consulting and supplies. These costs continued until December of 2008 when the application was submitted to the NRC. At the time that the COL costs started to decline, the cost category for COL Review started to accrue costs and continued until the Summer of 2017, even after DEC was granted its COL from the NRC in December 2016. DEC formally submitted its Request for Approval to Cancel the WSL Plant to the NRC on August 25, 2017. DEC's current strategy is to maintain the WSL Project COL until a future time that shows economic and environmental conditions once again indicate nuclear generation to be a reasonable choice for DEC to add to its generating portfolio. Until such time, however, DEC will be required to submit annual updates of its Final Safety Analysis Report ("FSAR"), including any design changes proposed by the NRC. Therefore there will be continuing costs that accrue to the NRC Review & Hearing Fees and to Post COL Licensing cost categories.

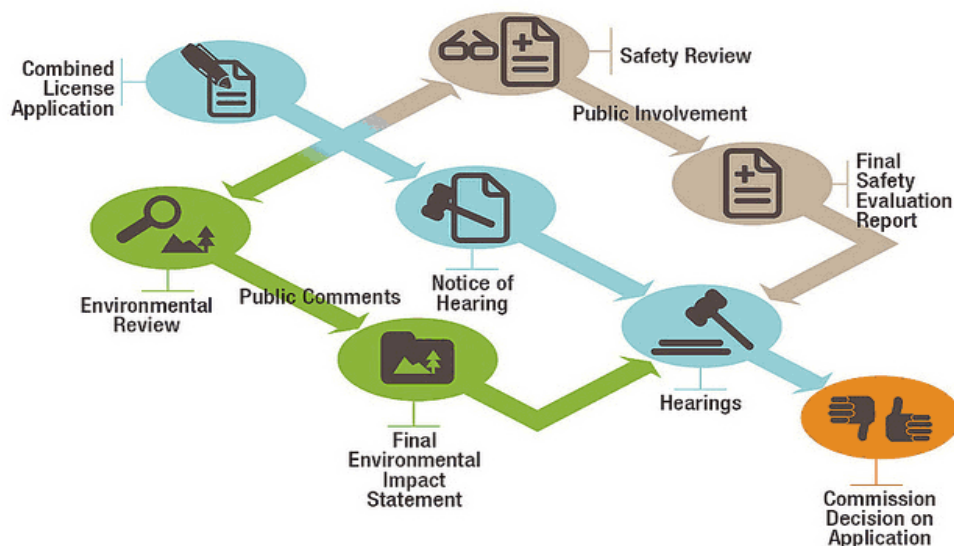
Section 3.2 – NRC REVIEW AND HEARING FEES –

The category of NRC Review and Hearing Fees "includes the cost of the NRC review fees, Duke labor and expenses, contract labor and legal support required to support the NRC review of the Lee Nuclear Station COL application, and preparation for the Advisory Committee on Reactor Safeguards Subcommittee Hearing. This category also includes interactions with South Carolina Department of Health and Environmental Control (SCDHEC) and the US Army Corps of Engineers (USA CE), as required to move the environmental permit applications forward. The Lee project received the National Pollutant Discharge Elimination System (NPDES) Operations permit on July 17, 2013. The Final Environmental Impact Statement was issued by the NRC on December 23, 2013, and the 401 Water Quality Certification was issued on January 2, 2014. The Final Environmental Impact Statement prepared by the U.S. Forest Service to support mitigation activities in Sumter National Forest was issued on December 5, 2014. Lee Nuclear Station received its USACE 404 Permit on September 29, 2015."

The NRC Review and Hearing Fees cost category captures costs associated with the NRC's review of the COL application along with costs for the NRC to hold various internal and public meetings associated with the review and approval process. In support of the internal NRC review of the application, there are externally driven process and regulatory requirements that must also be formalized and approved by the NRC. These externalities include the National Pollution Discharge Elimination System permit, Corps of Engineers 404 Permits, and State and Federal Air Quality & Emission

permits, along with specific State environmental permits that all support the Environmental Review and the Final Environmental Impact Statement (Green Path in the following picture).

New Reactor Licensing Process



The NRC convenes a third party independent Board, the Advisory Committee on Reactor Safety (“ACRS”), to evaluate the overall safety related issues of the technology selected, specific requirements of the AP 1000 certification process, and specific review of the Final Safety Evaluation Report and Advanced Final Safety Evaluation Report (“SER”). NRC employees with specific knowledge of law, engineering, and the nuclear industry are appointed by the Commission to conduct the formal license review process. Their function is held at arm’s length from the Commission itself to safe guard their independence and ethical standards. These NRC employee “review boards” assist the Commission with processing and approving applications, as well as reviewing on-going technical issues with the COL and project deployment following the issuance of the COL. The costs of these review boards, public hearings, and Applicant oversight are partially borne by the Applicant through the fees assessed by the NRC Safety Review path in the “New Reactor Licensing Process” figure above).

The NRC also convenes the Atomic Safety and Licensing Board Panel (“ASLBP”) that conducts hearings for the Commission. The specific responsibility of the ASLBP as it pertains to the COL process “is to conduct public hearings concerning contested issues that arise in the course of licensing and

enforcement proceedings regarding nuclear reactors and the civilian use of materials in the United States.”²

As a result of the review and approval process, these costs are appropriately included in the cost of obtaining and maintaining the COL along with the on-going compliance with COL requirements following the award of the COL to the Applicant. A summation of the COL costs and the NRC Review and Hearing Fees provides a much more representative cost of the COL, approximately \$150M+ in the case of WSL.

We evaluated specific contracts with Shaw/CB&I/Stone & Webster/Wectec, Enercon Services, and the US Nuclear Regulatory Commission for cost and decision compliance. These three (3) contracts totaled more than \$110M. Of particular interest is the contract amount of \$24.7M+ for the US NRC, which covered the hearing and various NRC review boards, inspections, etc., and were not in any way negotiable. We also found the costs billed by the Shaw Team and Enercon to be necessary, reasonable, and prudent.

Section 3.3 – LAND AND RIGHT-OF-WAY PURCHASES –

The category of Land and Right-of-Way Purchases “includes the purchase of land required for the Lee site and rail right-of-ways. Category also includes cost of purchasing additional land for a supplemental cooling pond in event of severe drought as well as costs for surveying the selected transmission right-of-way.”

The cost category of Land and Right-of-Way Purchases includes the purchase of the WSL site, as well as subsequent purchases to add additional acreage for necessary cooling and make-up water storage. Because most of the heavy forgings and modular structures were to be delivered to the site via railroad, access rights-of-way for rail service was also necessary. The total accrued cost for Land and Right-of-Way Purchases through June 2017 is approximately \$44.6M. 96% (\$43M) of this cost was incurred prior to the NCUC imposed requirement for six (6) month financial project reporting updates. The \$44.6M in Land and Right-of-Way includes \$14M for the purchase of the WSL Project site in 2006 and 2007. Electric generation from WSL Project was to have been interconnected to DEC’s existing grid

² <https://www.nrc.gov/about-nrc/regulatory/adjudicatory/aslbp-respons.html>

via overhead transmission lines constructed along purchased rights-of-way, included in in the Land and Right-of-Way Purchases category, but excluded from the \$14M purchase of the 1900 acre site, itself.

The Land and Right-of-Way category was essentially closed out as of June of 2014.

Section 3.4 – PRE-CONSTRUCTION AND SITE PREPARATION –

The category of Pre-Construction and Site Preparation “includes site activities to both maintain the site and prepare the site for construction. Site preparation activities included: dewatering and cleanup of the excavated area, site remediation activities required to identify and properly dispose of hazardous wastes, and costs associated with the demolition and removal of unusable structures. Necessary maintenance of existing rail bed and required Make-up Pond B spillway repair were completed. Engineering of offsite infrastructure for potable water, sewer, and rail spur; and, geotechnical evaluations (needed for engineering) have been completed. Engineering for bringing communications to the site is also included in this category. Engineering of necessary traffic improvements was brought to 85% completion by December 2013. Ongoing and continuing activities include: site security, utilities and miscellaneous site maintenance.”

The Pre-construction and Site Preparation category captures the costs for most of the identifying activities that are visible at the site today. It was necessary to begin pre -construction activities prior to the receipt of the COL in order to maintain the schedule for the original Commercial Operations Date (“COD”) of 2016 and subsequent later dates as the schedule was revised based on results of IRP analysis. It was also necessary to initiate pre-construction activities to support the Construction Engineering and Detailed Engineering functions. Much of the detailed engineering relied heavily on the findings of the pre-construction and site preparation activities for foundation designs, rail and road designs, infrastructure to support cooling water storage, make up water storage, on and offsite communications and security. These activities had to be completed prior to the issuance of the COL to avoid COD delay.

For all practical purposes, the activities associated with the Pre-Construction and Site Preparation were concluded in 2015. Prior to the 2015 period biennial costs were consistently in the \$2-4M range. Beginning in 2015 these biennial costs dropped to \$200-\$500K range and further decreased to \$40K range by 2017. However, there are on-going activities in this category in order to maintain the site conditions and provide on-site security.

Section 3.5 – SUPPLY CHAIN, CONSTRUCTION PLANNING, & DETAILED ENGINEERING –

The category of supply Chain, Construction Planning, & Detailed Engineering “includes activities associated with working with the supplier to negotiate an Engineering, Procurement and Construction (EPC) agreement. Negotiations in 2008 did not result in an executed contract. Conceptual site specific engineering and construction planning activities necessary to develop a complete project definition are included in this category. Continuing construction planning activities serve to further develop construction plans and keep the construction plans in line with latest engineering. Detailed site specific engineering began in January 2011 and was brought to 70% completion in December 2013. Commercial building design activities started in June 2012. Design of the first six commercial buildings was completed in December 2013.”

This category should be sub-categorized rather evaluated broadly. The three topics in the category heading are sufficiently different to warrant individual focus. The Supply Chain deals primarily with the contracting activities whether it be one Engineer, Procure, and Construction (“EPC”) contract, or several individual contracts managed by a General Contractor (“GC”). DEC originally intended to sign an EPC contract. The Westinghouse Consortium was contemplated as the best EPC choice based on knowledge, cost and expertise, but DEC could not come to a final resolution with Westinghouse on an EPC contract. Therefore, DEC acted as its own GC and initiated DEC’s own work schedule with contract assistance from Westinghouse, Shaw, Stone & Webster and CB&I, all members of the Westinghouse Consortium. Contracts for major installed equipment and large forgings were also covered under the Supply Chain. Many of these were to be constructed by international manufacturers such as Doosan (Korea), Mangiarotti (Italy), and Japan Steel Works, requiring extensive lead time and Supply Chain Management. Because DEC was unsuccessful with negotiating an EPC contract, it was DEC’s responsibility to develop the necessary policies and procedures for supply chain activities, including everything from international communications to in-country deliveries, as well as nuclear quality assurance and quality control (“QA/QC”).

Construction Planning is a huge and very costly undertaking on its own. Within Construction Planning resides the scheduling responsibility that must be integrated with all craft and contract labor, equipment purchases, site development, operational planning, design engineering, and NRC Licensing. Construction Planning touches all phases of project deployment. As such, it was essential to assign significant resources from the very first moment this project was conceived. Even with the Notice to

Cancel in August of 2017, Construction Planning activities are still on-going to assist with shutting down the project. Simply “closing the door” and walking away is not an option.

The Detailed Engineering function is self-evident. The number of design activities associated with a project of this magnitude is vast. As a result, the interface between engineering, supply chain, and construction planning is critical.

The total dollars accruing to the Supply Chain, Construction Planning, and Design Engineering through the Notice to Cancel is \$57M. This cost tracks consistently with the Vogtle and Summer sites for work accomplished in similar project periods. Nevertheless, there are some significant differences between the WSL site and the Summer and Vogtle sites. One of the major differences is that both Summer and Vogtle sites executed an EPC contract, while WSL did not. DEC’s failure to successfully negotiate an EPC contract was not a result of lack of effort on its part, however. In fact, a primary stumbling block to negotiating a successful EPC contract was the inability of Westinghouse to resolve issues it had with the transfer of intellectual property. The intellectual property in this case was analogous to the owner’s manual for an automobile. A utility owner of a nuclear plant, in this case DEC, needs all pertinent documentation, not just bits and pieces. This issue is still on-going today with both the Summer and Vogtle projects.

Section 3.6 – OPERATIONAL PLANNING –

The Operational Planning process “includes activities associated with operator and plant staff training, including costs associated with the Knowledge and Abilities Catalog, required for operator license examinations for AP 1000 plants, and the standardization of the nomenclature in the Westinghouse Master Equipment List (MEL). Continuing activities include: supporting operations program development, such as Quality Assurance (QA) Program, and the review of approximately 500 procedures. The training materials, operational programs, and operating procedures are all being developed in concert with other AP 1000 utilities within the APOG framework. The *Operational Planning* category also includes generation of administrative procedures that must be in place upon receipt of COL from NRC.”

Operational Planning is a critical component of the nuclear construction process. Typically, the operational planning component focuses on preparing human logistics for the long-term operations of the commercial plant. This involves the development of hundreds if not thousands of operating procedures detailing the application for every piece of equipment from the water coolers to the turbines

and generators, and thousands of subsets of each. As soon as a utility determines the technology it will deploy, the operational planning effort begins. The effort and the man-power requirements of the Operational Planning section continue to increase up to the point that actual plant operators are brought on-board to begin training. This effort begins very early in the pre-construction phase, as the first set of operators to be trained are actually being “trained to train” the next generation of operators. The training effort for the WSL plant began during the COL Application period. The COL Application must contain discussions of and commitments for Operational Planning. Upon receipt of the COL, there was a marked increase in the Operational Planning budget in order to ramp up the planning process because DEC’s intent was to move forward with the project. As soon as the DEC decision was made to terminate the project, the Operational Planning budget dropped rapidly beginning in 2017. The \$16.5M incurred to date for Operational Planning was well within the budgets of other plants we have reviewed at a similar stage of development.

Section 3.7 –POST COL –

A Combined Construction Permit and Operating License (COL) was received for the Lee AP 1000 Project in December 2016. Design finalization and first-of-a-kind construction issues at the lead plants (Summer 2 and 3, Vogtle 3 and 4) have required Westinghouse to make numerous changes to the AP 1000 design. Design changes continue to be issued as the lead plants advance towards completion. Submittal of an annual FSAR update and recurring regulatory reporting are required to maintain the COL.

The category of Post-COL was established to capture on-going costs associated with the continuing support of the COL.

The Post-COL category has only recently been added to DEC’s cost documentation. Its first entry was included for the period of January 1, 2017 through June 30, 2017. As the description provides, this category captures costs associated with on-going COL activities, primarily changes and updates to the certified design document as a result of “lessons learned” at the Vogtle and Summer sites. It also includes the necessary revision and annual submittal of the FSAR. It is difficult, if not impossible, to accurately forecast a budget for this category as it is not known what might be found at the Vogtle and Summer sites that must be modified and subjected to the FSAR review. However, as long as DEC maintains the COL and as long as there is construction progress at the Vogtle or Summer sites, Post-COL costs will be incurred.

Section 3.8 – AFUDC -

The cost category of AFUDC is the net cost of money used for construction purposes. Critical to the determination of AFUDC is the weighted cost of money, the Return on Equity approved by the NCUC, determination of the exact start date for which AFUDC can be accrued, any temporary halt in construction, and the date at which the AFUDC is no longer allowed to accrue.

AFUDC for the WSL plant has been accruing since 2004. To compare AFUDC for one utility's project to that of another utility is simply not possible due to varying costs of money over time, different commercial ratings impact on borrowing costs, timeframe for accruing AFUDC, cashflow of dollars, and timing of the expenditures relative to each of the utilities. However, all things being equal, the total AFUDC for one utility relative to another can be compared as a data point. However, since WSL has been cancelled and Vogtle and Summer continued through the Fall of 2017, it is not advisable to make this comparison because the decisions of each utility relative to their own set of specific issues such how to proceed during bankruptcy proceedings, if the continuation will actually occur, and certainly how will future cashflow and contracts be resolved by each utility will affect the accounting of AFUDC dependent on the specific utility's decisions. The only measure of appropriateness would be an accounting analysis to make certain that DEC is using the correct interest rates, ROE, and other embedded variables. The Public Staff is conducting further analysis regarding AFUDC, including the accounting treatment, and the beginning and end dates.

SECTION 4.0 REQUEST FOR APPROVAL TO CANCEL THE W. S. LEE NUCLEAR PROJECT:

DEC received a COL from the NRC on December 19, 2016. Prior to this date, DEC had been pursuing the COL and preparing the site for construction since the early 2000's. During the period of 2008 through 2017, many externalities affected DEC's ability and need to continue the pursuit of the WSL Project. Significant among these were: sluggish economic conditions between 2008 and 2016, decreased natural gas prices as a result of the advancements of fracking technology; stagnant or in some cases, retracting forecasts of load growth; and the impact on the nuclear technology revolution as a result of the failures of Westinghouse and its subsequent filing for bankruptcy protection. Additionally, the new units under construction at the V. C. Summer Plant and the Alvin W. Vogtle Plant were not progressing as forecast, schedules were falling significantly behind, and cost overruns were beginning to critically erode their economic viability. In other words, over the last five (5) years a "perfect storm" has descended upon the nuclear industry.

Because DEC was in the midst of permitting and licensing the WSL Plant, without legislation from the North Carolina General Assembly permitting recovery of CWIP financing costs outside of a general rate case, and with no immediate prospects for the passage of any such legislation, DEC determined that while it should continue to pursue its COL, along with pre-construction activities to “maintain the status quo” (See Sub 819 Order issued August 5, 2011), it should not move forward with construction. DEC received the COL in December of 2016. Economic conditions still had not improved significantly, and with the significant scale back of carbon regulation through court delays and by the Trump Administration, the IRP process indicated the need for baseload generation, and particularly nuclear baseload generation, had been delayed until the late 2020s. Westinghouse’s problems with continuing construction at the Summer and Vogtle sites were also beginning to manifest themselves during this time period. Early in 2017, Westinghouse announced it had suffered significant losses from its AP 1000 projects in the US. Finally, on March 29, 2017, Westinghouse filed for bankruptcy protection under Chapter 11. The announcement by Westinghouse and the subsequent financial issues relative to bankruptcy led to the Summer project being canceled, but the Vogtle project has recently been allowed to proceed subject to significant regulatory scrutiny to which Georgia Power/Southern Nuclear has agreed.

As a result of this perfect storm scenario, DEC elected to file the Request to Cancel the W. S. Lee Project. We believe that based on the changes to economic conditions, the Westinghouse bankruptcy, and issues being experienced at Summer and Vogtle, DEC’s decision to cancel the W. S. Lee Project was, in our opinion, reasonable and prudent. Therefore, it is our opinion, to the extent that Commission approval of DEC’s decision to cancel the W. S. Lee project is required (which would require a legal opinion beyond the scope of our expertise or employment), that the Request to Cancel the W. S. Lee Plant be approved. We note that currently, DEC has a viable COL for the W. S. Lee project and has the site under its ownership. There are significant pre-construction activities completed and design documents completed. The project could be resurrected should all of the concerns previously identified be positively addressed.

Appendix: Qualifications of Global Energy & Water Consulting, LLC

MARK W. CRISP – PROJECT MANAGER

Mark W. Crisp is Managing Consultant with Global Energy & Water Consulting, LLC. His 35+ years of experience in the electric and water utility industry covers most functional areas of these utilities including construction of water & wastewater facilities, electric generation, transmission, operations, **utility economics, regulatory compliance, policy and prudence**. He has managed projects ranging from a few million dollars to well over \$9 Billion. He is recognized as an Expert in his fields throughout the US and the International community including electric restructuring, generating resource selection, renewable energy in the form of biomass, wind, PV, and hydro. He is regularly engaged to provide immediate solutions. He has successfully guided clients through such issues as **wholesale and retail electric accounting issues**, unbundling of services, FERC open access transmission, **integrated resource planning (“IRP”)**, FERC and NRC licensing, as well as, fuel hedging strategies. Mr. Crisp is a recognized expert on utility issues and has provided expert witness and testimony before several state regulatory bodies, the FERC, the NRC, Federal and State courts, and the US Congress.

Mr. Crisp, teaming with longtime partner Mr. George Evans, has most recently completed the review, analysis and acknowledgment of the IRP’s submitted to the Arizona Corporation Commission for the first review under the newly approved IRP Rules in Arizona. This analysis included the review of IRP’s submitted by Arizona Public Service, Tucson Electric, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc. The process in Arizona is very similar to the requirements in Louisiana in that we performed the review of the IRP’s, facilitated public input sessions, evaluated not only conventional resource planning but also included demand-side management, renewable requirements of the State and transmission.

Mr. Crisp is a “hands-on” consultant having spent 20 years of his career working for Electric Utilities. His experience includes clients and projects around the world. The following sample of engagements is indicative of Mark’s diverse skills and breadth of experience.

- **State Regulatory bodies in Arizona, Connecticut, Georgia, Maryland, South Carolina, Mississippi, Arizona and Utah**
- Southeastern Federal Power Customers (Group of Electric Cooperatives and Municipal Electric systems throughout the Southeastern US)
- El Paso Electric Company
- Northeast Utilities
- Niagara Mohawk
- City of Walla Walla, Washington
- City of LaGrange, Georgia
- City of Litchfield Park, Arizona
- City of North Little Rock, Arkansas
- City of Ocala, Florida
- International Privatization of Utility Assets in Argentina, Brazil, Chile, Ecuador, Nicaragua, Australia and Europe
- Puerto Rican Electric Authority (“PREPA”)
- Tennessee Valley Authority (“TVA”)
- South Texas Electric Cooperative (“STEC”)
- GLOBALCON Holdings
- Highland Nigeria Limited
- Highland Energy Solution Services Limited
- Oglethorpe Power Corporation (“OPC”)
- Grand River Dam Authority (“GRDA”)
- US DOE and US DoD
- Utility Privatization for Marine Corps and Navy Bases throughout California, Arizona and Nevada

Mark has Bachelor degrees in Civil and Electrical Engineering from the Georgia Institute of Technology ("Ga. Tech") along with Master of Business Administration (Finance and Accounting) from the University of Arkansas at Little Rock.

Mark is a registered professional engineer in the States of Georgia, Florida and South Carolina.

Power Plant Experience:

Nuclear Power Generating Facilities

Plant Vogtle – Georgia Power Company (Southern Nuclear)
 Plant Hatch – Georgia Power Company (Southern Nuclear)
 Plant Farley – Alabama Power Company (Southern Nuclear)
 Palo Verde – Arizona Public Service and Joint Owners
 North Anna Power Station – Dominion Resources
 Bellefonte – Tennessee Valley Authority
 V. C. Summer – South Carolina Gas & Electric
 Monticello Nuclear – Xcel Energy
 Prairie Island Nuclear – Xcel Energy
 Arkansas Nuclear 1 – Entergy Arkansas

Coal-fired Generating Facilities

Plant Bowen – Georgia Power Company
 Plant Branch – Georgia Power Company
 Plant Hammond – Georgia Power Company
 Plant McDonough – Georgia Power Company
 Plant Mitchell – Georgia Power Company
 Colbun System – Chile S.A.
 Mejionelles – Chile S.A.
 Puerto Rican Electric Power Authority San Juan, Puerto Rico

Hydro-electric Generating Facilities (Domestic)

Wallace Dam – Georgia Power Company
 Sinclair Dam – Georgia Power Company
 Rocky Mountain Pumped Storage Project – Georgia Power Company
 Bartlett's Ferry Dam – Georgia Power Company
 Oliver Dam – Georgia Power Company
 Jackson Dam – Georgia Power Company
 Allatoona Dam – U.S. Army Corps of Engineers

Buford Dam – U.S. Army Corps of Engineers
 Carter’s Dam – U.S. Army Corps of Engineers
 Hartwell Dam – U.S. Army Corps of Engineers
 Richard Russell Pumped Storage Project – U.S. Army Corps of Engineers
 Strom Thurmond Dam – U.S. Army Corps of Engineers
 West Point Dam – U.S. Army Corps of Engineers
 W. F George Dam – U.S. Army Corps of Engineers
 Jim Woodruff Dam – U.S. Army Corps of Engineers
 Wolf Creek Dam – U.S. Army Corps of Engineers
 Center Hill Dam – U.S. Army Corps of Engineers
 Texoma Dam – U.S. Army Corps of Engineers
 Dennison Dam – U.S. Army Corps of Engineers
 Amistad Dam – International Boundary Waters Commission
 Falcon Dam – International Boundary Waters Commission

Hydro-electric Generating Facilities (International)

Alicura - Argentina	El Toro - Argentina
Piedra del Aquila - Argentina	El Tigre - Argentina
El Chocon - Argentina	Los Nihuiles - Argentina
El Chanar - Argentina	Pichi Picun Lefue - Argentina
Cerros Coloradas - Argentina	Yacereta – Argentina & Paraguay
Los Reyunes - Argentina	Itaipu – Argentina – Paraguay
Copalar – Nicaragua	Undeveloped Sites in Ecuador
Undeveloped Sites in Sub-Saharan Africa	

Renewable Energy Projects (Domestic)

Milam Tennessee – Waste to Energy - Green Power Inc.
 Wyoming Wind
 Milledgeville, GA. Waste To Energy and PV - SolarZone, LLC

Renewable Energy Projects (International)

Haiti Reconstruction
 Lagos, Nigeria WTE
 Nigeria Transitional Gas Power Plant

Testimony and Expert Witness

State of Arizona Corporation Commission
 State of South Carolina Public Service Commission
 State of Georgia Public Service Commission
 State of Mississippi Public Service Commission
 State of Maryland Public Service Commission
 State of Utah Public Utilities Commission
 Federal Energy Regulatory Commission
 Nuclear Regulatory Commission
 United States Congress
 Federal District Court of Washington D.C.
 5th Circuit Court of Appeals – Washington DC
 Federal District Court in the Northern District of Georgia
 Federal District Court in the Northern District of Alabama
 US Court of Appeals - 11th Circuit

Abbreviated List of Testimony and Filings before State Regulatory Bodies

Arizona Commerce Commission DOCKET NO. E-00000A-11-0113, December 2012

Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.

Arizona Commerce Commission DOCKET NO. E-00000V-13-0070, December 2014

Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.

South Carolina Office of Regulatory Staff DOCKET NO. 2008-196-E, October 2008

Review and Determination of Approval of a Combined Application of SCE&G for the Construction and Operation of Units 2 & 3 at V.C. Summer Nuclear Facility

South Carolina Office of Regulatory Staff DOCKET NO. 2009-293-E, September 2009

Update of Construction Progress and Request for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility

South Carolina Office of Regulatory Staff DOCKET NO. 2010-376-E, February 2011

Petition of South Carolina Electric & Gas Company for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility

Minnesota Department of Commerce, Energy Resources Division, DOCKET NO. E002/CI-13-754, July 2014,

Investigation into Xcel Energy's Monticello Nuclear Plant Life Cycle Management/Extended Power Uprate Project and Request for Recovery of Cost Overruns

City of Miami, Florida Office of the City Attorney, DOCKET NO. 52-040 & 52-041, May 2017

Affidavit Before the Nuclear Regulatory Commission ("NRC") In the Matter of Florida Power & Light's Turkey Point Unit 6 & 7 Combined Operating License

Utah Division of Public Utilities, DOCKET NO. 10-035-124, May 2011

In the Matter of the Application of Rocky Mountain Power For Authority to Increase its Retail Electric Utility Service rates in Utah and for Approval of its Proposed Electric Service Schedules and Electric Service Regulations.

Mississippi Public Utilities Staff, DOCKET NO. 2010-UA-374, July 2013

Entergy Mississippi, Inc. Application for Approval of Accounting Treatment for Grand Gulf 3; "Costs Incurred in Connection with Generation Resource Planning, Evaluation, Monitoring, and Development of Activities Related to Grand Gulf 3"

Staff of the Georgia Public Service Commission, DOCKET NO. 17687-U, April 2004

Georgia Power Company's Application for Approval of its 2004 Integrated Resource Plan

Staff of the Georgia Public Service Commission, DOCKET NO. 17688-U, April 2004

Savannah Electric and Power Company's Application for Approval of its 2004 Integrated Resource Plan

Staff of the Georgia Public Service Commission, DOCKET NO. 24505-U, April 2007

Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan

William R. Jacobs, Jr.
Executive Consultant

EDUCATION: Ph.D., Nuclear Engineering, Georgia Tech 1971

MS, Nuclear Engineering, Georgia Tech 1969

BS, Mechanical Engineering, Georgia Tech 1968

ENGINEERING REGISTRATION: Registered Professional Engineer

PROFESSIONAL MEMBERSHIP: American Nuclear Society

EXPERIENCE:

Dr. Jacobs has over thirty-five years of experience in a wide range of activities in the electric power generation industry. He has extensive experience in the construction, startup and operation of nuclear power plants. While at the Institute of Nuclear Power Operation (INPO), Dr. Jacobs assisted in development of INPO's outage management evaluation group. He has provided expert testimony related to nuclear plant operation and outages in Texas, Louisiana, South Carolina, Florida, Wisconsin, Indiana, Georgia and Arizona. He currently provides nuclear plant operational monitoring services for GDS clients. Dr. Jacobs was a witness in nuclear plant certification hearings in Georgia for the Plant Vogtle 3 and 4 project on behalf of the Georgia Public Service Commission and in South Carolina for the V.C. Summer 2 and 3 projects on behalf of the South Carolina Office of Regulatory Staff. His areas of expertise include evaluation of reactor technology, EPC contracting, risk management and mitigation, project cost and schedule. He is assisting the Florida Office of Public Counsel in monitoring the development of four new nuclear units in the State of Florida, Levy County Units 1 and 2 and Turkey Point Units 6 and 7. He also evaluated extended power uprates on five nuclear units for the Florida Office of Public Counsel. He has been selected by the Georgia Public Service Commission as the Independent Construction Monitor for Georgia Power Company's new AP1000 nuclear power plants, Plant Vogtle Units 3 and 4. He has assisted the Georgia Public Service Commission staff in development of energy policy issues related to supply-side resources and in evaluation of applications for certification of power generation projects and assists the staff in monitoring the construction of these projects. He has also assisted in providing regulatory oversight related to an electric utility's evaluation of responses to an RFP for a supply-side resource and subsequent negotiations with short-listed bidders. He has provided technical litigation support and expert testimony support in several complex law suits involving power generation facilities. He monitors power plant operations for GDS clients and has provided testimony on power plant operations and decommissioning in several jurisdictions. Dr. Jacobs represents a GDS client on the management committee of a large coal-fired power plant currently under construction. Dr. Jacobs has provided testimony before the Georgia Public Service Commission, the Public Utility Commission of Texas, the North Carolina Utilities Commission, the South Carolina Public Service Commission, the Iowa State Utilities Board, the Louisiana Public Service Commission, the Florida Public Service Commission,

the Indiana Regulatory Commission, the Wisconsin Public Service Commission, the Arizona Corporation Commission and the FERC.

A list of Dr. Jacobs' testimony is available upon request.

1986-Present GDS Associates, Inc.

As Executive Consultant, Dr. Jacobs assists clients in evaluation of management and technical issues related to power plant construction, operation and design. He has evaluated and testified on combustion turbine projects in certification hearings and has assisted the Georgia PSC in monitoring the construction of the combustion turbine projects. Dr. Jacobs has evaluated nuclear plant operations and provided testimony in the areas of nuclear plant operation, construction prudence and decommissioning in nine states. He has provided litigation support in complex law suits concerning the construction of nuclear power facilities. Dr. Jacobs is the Georgia PSC's Independent Construction Monitor for the Plant Vogtle 3 and 4 nuclear project.

1985-1986 Institute of Nuclear Power Operations (INPO)

Dr. Jacobs performed evaluations of operating nuclear power plants and nuclear power plant construction projects. He developed INPO Performance Objectives and Criteria for the INPO Outage Management Department. Dr. Jacobs performed Outage Management Evaluations at the following nuclear power plants:

- Connecticut Yankee - Connecticut Yankee Atomic Power Co.
- Callaway Unit I - Union Electric Co.
- Surry Unit I - Virginia Power Co.
- Ft. Calhoun - Omaha Public Power District
- Beaver Valley Unit 1 - Duquesne Light Co.

During these outage evaluations, he provided recommendations to senior utility management on techniques to improve outage performance and outage management effectiveness.

1979-1985 Westinghouse Electric Corporation

As site manager at Philippine Nuclear Power Plant Unit No. 1, a 655 MWe PWR located in Bataan, Philippines, Dr. Jacobs was responsible for all site activities during completion phase of the project. He had overall management responsibility for startup, site engineering, and plant completion departments. He managed workforce of approximately 50 expatriates and 1700 subcontractor personnel. Dr. Jacobs provided day-to-day direction of all site activities to ensure establishment of correct work priorities, prompt resolution of technical problems and on schedule plant completion.

Prior to being site manager, Dr. Jacobs was startup manager responsible for all startup activities including test procedure preparation, test performance and review and acceptance of test results. He established the system turnover program, resulting in a timely turnover of systems for startup testing.

As startup manager at the KRSKO Nuclear Power Plant, a 632 MWE PWR near Krsko, Yugoslavia, Dr. Jacobs' duties included development and review of startup test procedures, planning and coordination of all startup test activities, evaluation of test results and customer assistance with regulatory questions. He had overall responsibility for all startup testing from Hot Functional Testing through full power operation.

1973 - 1979 NUS Corporation

As Startup and Operations and Maintenance Advisor to Korea Electric Company during startup and commercial operation of Ko-Ri Unit 1, a 595 MWE PWR near Pusan, South Korea, Dr. Jacobs advised KECO on all phases of startup testing and plant operations and maintenance through the first year of commercial operation. He assisted in establishment of administrative procedures for plant operation.

As Shift Test Director at Crystal River Unit 3, an 825 MWE PWR, Dr. Jacobs directed and performed many systems and integrated plant tests during startup of Crystal River Unit 3. He acted as data analysis engineer and shift test director during core loading, low power physics testing and power escalation program.

As Startup engineer at Kewaunee Nuclear Power Plant and Beaver Valley, Unit 1, Dr. Jacobs developed and performed preoperational tests and surveillance test procedures.

1971 - 1973 Southern Nuclear Engineering, Inc.

Dr. Jacobs performed engineering studies including analysis of the emergency core cooling system for an early PWR, analysis of pressure drop through a redesigned reactor core support structure and developed a computer model to determine tritium build up throughout the operating life of a large PWR.

SIGNIFICANT CONSULTING ASSIGNMENTS:

Georgia Public Service Commission – Selected as the Independent Construction Monitor to assist the GPSC staff in monitoring all aspects of the design, licensing and construction of Plant Vogtle Units 3 and 4, two AP1000 nuclear power plants.

Georgia Public Service Commission – Assisted the Georgia Public Service Commission Staff and provided testimony related to the evaluation of Georgia Power Company's request for certification to construct two AP1000 nuclear power plants at the Plant Vogtle site.

South Carolina Office of Regulatory Staff – Assisted the South Carolina Office of Regulatory Staff in evaluation of South Carolina Electric and Gas' request for certification of two AP1000 nuclear power plants at the V.C. Summer site.

Florida Office of Public Counsel – Assists the Florida Office of Public Counsel in monitoring the development of four new nuclear power plants and extended power uprates on five nuclear units in Florida including providing testimony on the prudence of expenditures.

East Texas Electric Cooperative – Represented ETEC on the management committee of the Plum Point Unit 1 a 650 Mw coal-fired plant under construction in Osceola, Arkansas and represents ETEC on the management committee of the Harrison County Power Project, a 525 Mw combined cycle power plant located near Marshall, Texas.

Arizona Corporation Commission – Evaluated operation of the Palo Verde Nuclear Generating Station during the year 2005. Included evaluation of 11 outages and providing written and oral testimony before the Arizona Corporation Commission.

Citizens Utility Board of Wisconsin – Evaluated Spring 2005 outage at the Kewaunee Nuclear Power Plant and provided direct and surrebuttal testimony before the Wisconsin Public Service Commission.

Georgia Public Service Commission - Assisted the Georgia PSC staff in evaluation of Integrated Resource Plans presented by two investor owned utilities. Review included analysis of purchase power agreements, analysis of supply-side resource mix and review of a proposed green power program.

State of Hawaii, Department of Business, Economic Development and Tourism – Assisted the State of Hawaii in development and analysis of a Renewable Portfolio Standard to increase the amount of renewable energy resources developed to meet growing electricity demand. Presented the results of this work in testimony before the State of Hawaii, House of Representatives.

Georgia Public Service Commission - Assisted the Georgia PSC staff in providing oversight to the bid evaluation process concerning an electric utility's evaluation of responses to a Request for Proposals for supply-side resources. Projects evaluated include simple cycle combustion turbine projects, combined cycle combustion turbine projects and co-generation projects.

Millstone 3 Nuclear Plant Non-operating Owners – Evaluated the lengthy outage at Millstone 3 and provided analysis of outage schedule and cost on behalf of the non-operating owners of Millstone 3. Direct testimony provided an analysis of additional post-outage O&M costs that would result due to the outage. Rebuttal testimony dealt with analysis of the outage schedule.

H.C. Price Company – Evaluated project management of the Healy Clean Coal Project on behalf of the General Contractor, H.C. Price Company. The Healy Clean Coal Project is a 50 megawatt coal burning power plant funded in part by the DOE to demonstrate advanced clean coal technologies. This project involved analysis of the project schedule and evaluation of the impact of the owner's project management performance on costs incurred by our client.

Steel Dynamics, Inc. – Evaluated a lengthy outage at the D.C. Cook nuclear plant and presented testimony to the Indiana Utility Regulatory Commission in a fuel factor adjustment case Docket No. 38702-FAC40-S1.

Florida Office of Public Counsel - Evaluated lengthy outage at Crystal River Unit 3 Nuclear Plant. Submitted expert testimony to the Florida Public Service Commission in Docket No. 970261-EI.

United States Trade and Development Agency - Assisted the government of the Republic of Mauritius in development of a Request for Proposal for a 30 MW power plant to be built on a Build, Own, Operate (BOO) basis and assisted in evaluation of Bids.

Louisiana Public Service Commission Staff - Evaluated management and operation of the River Bend Nuclear Plant. Submitted expert testimony before the LPSC in Docket No. U-19904.

U.S. Department of Justice - Provided expert testimony concerning the in-service date of the Harris Nuclear Plant on behalf of the Department of Justice U.S. District Court.

City of Houston - Conducted evaluation of a lengthy NRC required shutdown of the South Texas Project Nuclear Generating Station.

Georgia Public Service Commission Staff - Evaluated and provided testimony on Georgia Power Company's application for certification of the Intercession City Combustion Turbine Project - Docket No. 4895-U.

Seminole Electric Cooperative, Inc. - Evaluated and provided testimony on nuclear decommissioning and fossil plant dismantlement costs - FERC Docket Nos. ER93-465-000, et al.

Georgia Public Service Commission Staff - Evaluated and prepared testimony on application for certification of the Robins Combustion Turbine Project by Georgia Power Company - Docket No. 4311-U.

North Carolina Electric Membership Corporation - Conducted a detailed evaluation of Duke Power Company's plans and cost estimate for replacement of the Catawba Unit 1 Steam Generators.

Georgia Public Service Commission Staff - Evaluated and prepared testimony on application for certification of the McIntosh Combustion Turbine Project by Georgia Power Company and Savannah Electric Power Company - Docket No. 4133-U and 4136-U.

New Jersey Rate Counsel - Review of Public Service Electric & Gas Company nuclear and fossil capital additions in PSE&G general rate case.

Corn Belt Electric Cooperative/Central Iowa Power Electric Cooperative - Directs an operational monitoring program of the Duane Arnold Energy Center (565 Mwe BWR) on behalf of the non-operating owners.

Cities of Calvert and Kosse - Evaluated and submitted testimony of outages of the River Bend Nuclear Station - PUCT Docket No. 10894.

Iowa Office of Consumer Advocate - Evaluated and submitted testimony on the estimated decommissioning costs for the Cooper Nuclear Station - IUB Docket No. RPU-92-2.

Georgia Public Service Commission/Hicks, Maloof & Campbell - Prepared testimony related to Vogtle and Hatch plant decommissioning costs in 1991 Georgia Power rate case - Docket No. 4007-U.

City of El Paso - Testified before the Public Utility Commission of Texas regarding Palo Verde Unit 3 construction prudence - Docket No. 9945.

City of Houston - Testified before Texas Public Utility Commission regarding South Texas Project nuclear plant outages - Docket No. 9850.

NUCOR Steel Company - Evaluated and submitted testimony on outages of Carolina Power and Light nuclear power facilities - SCPSC Docket No. 90-4-E.

Georgia Public Service Commission/Hicks, Maloof & Campbell - Assisted Georgia Public Service Commission staff and attorneys in many aspects of Georgia Power Company's 1989 rate case including nuclear operation and maintenance costs, nuclear performance incentive plan for Georgia and provided expert testimony on construction prudence of Vogtle Unit 2 and decommissioning costs of Vogtle and Hatch nuclear units - Docket No. 3840-U.

Swidler & Berlin/Niagara Mohawk - Provided technical litigation support to Swidler & Berlin in law suit concerning construction mismanagement of the Nine Mile 2 Nuclear Plant.

Long Island Lighting Company/Shea & Gould - Assisted in preparation of expert testimony on nuclear plant construction.

North Carolina Electric Membership Corporation - Prepared testimony concerning prudence of construction of Carolina Power & Light Company's Shearon Harris Station - NCUC Docket No. E-2, Sub537.

City of Austin, Texas - Prepared estimates of the final cost and schedule of the South Texas Project in support of litigation.

Tex-La Electric Cooperative/Brazos Electric Cooperative - Participated in performance of a construction and operational monitoring program for minority owners of Comanche Peak Nuclear Station.

Tex-La Electric Cooperative/Brazos Electric Cooperative/Texas Municipal Power Authority (Attorneys - Burchette & Associates, Spiegel & McDiarmid, and Fulbright & Jaworski) - Assisted GDS personnel as consulting experts and litigation managers in all aspects of the lawsuit brought by Texas Utilities against the minority owners of Comanche Peak Nuclear Station.

GEORGE W. EVANS – UTILITY COST AND REPLACEMENT ENERGY CONSULTANT**EDUCATION:**

Master of Science, Applied Mathematics, Georgia Institute of Technology, 1976

Bachelor of Science, Applied Mathematics, Georgia Institute of Technology, 1974

PROFESSIONAL MEMBERSHIP:

Institute of Electrical and Electronic Engineers

EXPERIENCE:

Mr. Evans is the President of Evans Power Consulting, Inc. he has served the electric power utility industry for over thirty years. His primary areas of expertise include market price forecasting, integrated resource planning, the analysis of purchased power, system operations, interruptible rates, the optimal scheduling of generator maintenance, demand-side resources, and the computer simulation of electric power systems. As an expert witness in these areas, Mr. Evans has submitted testimony on over 40 occasions, before the FERC, the Georgia Public Service Commission, the Pennsylvania Public Utilities Commission, the South Dakota Public Utility Commission, the Michigan Public Service Commission, the Alabama PSC, the Mississippi PSC, the Colorado PUC, the Delaware PSC, the Utah PSC, the South Carolina PSC, and the Arkansas PSC. He is an expert in the utilization of Strategist and PROMOD and is a nationally recognized expert in the application of these simulation models.

Specific Experience Includes:

1997-2011 Slater Consulting

Golden Spread Electric Cooperative – Presented expert testimony in a FERC complaint concerning the actual operation of an economy sales agreement between Golden Spread and Southwestern Public Service Company.

Cooper Nuclear Plant - Development of the estimated damages caused by imprudent outages of a Nebraska nuclear generating unit.

Millstone 3 Nuclear Unit - Analysis of the replacement energy costs for the Millstone 3 nuclear unit on behalf of the co-owners.

Independent Power Producers - Presented expert testimony before the Alabama and Mississippi PSCs concerning the construction of new combined cycle facilities in those states.

S.C. State Energy Office - Developed a report summarizing and evaluating the Integrated Resource Plans filed by the electric utilities of South Carolina.

1989-1997 GDS Associates, Inc.

Mr. Evans served as a principal and the Manager of the System Modeling group, where he was responsible for performing analyses, providing expert testimony and developing customized software. He is an expert in the use of the industry standard computer models PROMOD III, PROSCREEN II, PROVIEW, MAINPLAN, CAT II and ENPRO. A sampling of representative assignments follows:

Tenaska, Air Liquide & Tenneco - Developed forecasts of market clearing prices for electricity in the ERCOT region.

GEMC - Produced a forecast of market clearing prices for electricity in the SERC region and estimated stranded costs.

Central Virginia Electric Cooperative - Designed, developed and installed software to allow the Cooperative to purchase economy energy in an optimal manner on a daily basis.

City of Grand Island, Nebraska - Developed the initial Integrated Resource Plan for the City of Grand Island.

Georgia PSC - Evaluated the 1995 Integrated Resource Plans filed by Georgia Power and Savannah Electric. Developed alternative Integrated Resource plans that were approved by the Commission.

Nucor Steel - Audited the bills for electric service for the Nucor-Hickman Steel Mill.

Nucor Steel - Testified before the Arkansas PSC concerning the reasonableness of a buy-through clause for interruptible customers.

Nucor Steel - Developed a comprehensive forecast of the likely levels of interruptions of service over the next ten years.

South Dakota Public Utility Commission - Evaluated the rate filing and Integrated Resource Plan filed by Black Hills Power & Light.

Georgia PSC - Evaluated Georgia Power's initial RFP for power, all bids received and Georgia Power's selection process. Testified before the Georgia PSC concerning the reasonableness of Georgia Power's evaluation process and resulting request for certification.

Michigan Attorney General - Performed studies concerning the availability of the Midland Cogeneration Venture and Consumer Power Company's avoided costs.

Michigan Attorney General - Developed estimates of cost reductions due to improved projected fossil performance and changes in cogeneration levels in a Consumers Power rate case.

Pennsylvania PUC - Testified concerning the capacity needs of a Pennsylvania utility and the appropriate avoided costs due potential cogeneration projects.

Golden Spread Electric Cooperative - Developed detailed historical reconstructions of five years of hourly operations of a major Texas utility to illustrate the penalties arising to wholesale ratepayers as a result of off-system sales.

Sam Rayburn G&T - Designed, developed and implemented a PC-based software system to facilitate daily load forecasting, optimal resource scheduling and inadvertent accounting in a user-friendly fashion.

Tex-La Electric Cooperative - Designed, developed and implemented a similar software system for daily load forecasting and optimal resource scheduling. This application also included the development of an optimization process which maximizes the total economy energy scheduled while adhering to limitations on load factor and the number of hourly changes.

PG&E-Bechtel Generating Company - Assisted this NUG developer in forecasting the dispatchability of a project and estimating likely costs in a power bidding solicitation.

1980-1989 Energy Management Associates, Inc. - now known as Ventyx

While with EMA, Mr. Evans performed product development, maintenance programming and client support on the three major products marketed and developed by EMA - PROMOD III, PROSCREEN II, and MAINPLAN. He is extremely well-versed in the development of databases for these tools and in applying these tools to particular studies.

As MAINPLAN Product Manager (1985-1989), Mr. Evans supervised and directed the development, maintenance, and client support for MAINPLAN - the software package that is the industry leader in the area of generating unit maintenance scheduling. The client base for MAINPLAN grew from two clients to over thirty clients during his involvement. Also during his tenure, a chronological production costing model was added to MAINPLAN. This highly detailed model has been used to evaluate interchange opportunities, the cost of forced outages, short-term fuel requirements and unit commitment strategies.

Publications:

Backcasting - A new computer application can determine historical truth for utilities that must refute damage claims, Fortnightly, October 1, 1993.

"Avoiding and Managing Interruptions of Electric Service under an Interruptible Contract or Tariff", Industrial Energy Technology Conference, April, 1995.

"Analysis and Evaluation of the Integrated Resource Plans of the Investor-Owned and State-Owned Electric Utilities in South Carolina", for the South Carolina State Energy Office, April, 1998.